JOHN DEUTSCH INSTITUTE FOR THE STUDY OF ECONOMIC POLICY

The Political Economy of the Munitions Supply Program

Ugurhan Berkok
Royal Military College of Canada and Queen's University

Christopher E. Penney
Royal Military College of Canada

Defence R&D Canada - CORA
Contract Report
May 2014

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

DRDC-RDDC-2014-C92

Prepared by: Ugurhan Berkok

Project Manager: Robert M.H. Burton

Contract Number: PA13008

Contract Scientific Authority: Binyam Solomon, TL Defence Economics Team, DRDC CORA, 613-996-6511

Abstract

The Munitions Supply Program (MSP) is a long-term procurement program that sustains a domestic munitions industrial base that consists of a group of government-franchised monopolies contracted by Public Works and Government Services Canada (PWGSC) on behalf of the Department of National Defence. This report first provides an overview of the evolution of the program from its beginnings in the late 1970s to where it stands today. Further, in order to establish a perspective on modern MSP policy, this report investigates the approaches other nations have adopted in managing their own munitions industrial bases. The countries included in the analysis are Australia and the United Kingdom, which account for a significant range of industrial capabilities and policy perspectives.

This study also provides an analytical examination of MSP policy, in particular looking at two groups of policy questions. The first pertains to security of supply vision that drove the MSP by requiring domestic production of mostly army munitions but may be perceived as very different in the post-Cold War period. The imposed domestic structure of the industry, its organization and resulting incentives, and the retainer premium are analyzed in detail. The second covers the contractual issues related, in particular, to the priority of supply and the implied requirement of a surge capacity which, in turn, generates a peak-load premium.

Having underlined the need for change but abstaining from policy suggestions that might not fit the Canadian policy environment, the report concludes by offering five feasible policy suggestions that aim to preserve the security of supply but at least partially dispose of the premia.

Executive Summary

The Munitions Supply Program, introduced in 1978, was initially aimed at addressing a multitude of inherent risks and deficiencies in the Canadian munitions industrial base; in particular, due to the political context of the time, there existed a desire to ensure the security of supply of high-volume munitions in the event of sustained conflict. The MSP has had successes in some areas such as the modernization of production operations for a number of key facilities and the increased competitiveness of Canadian munitions firms. Recently, however, important questions have been raised regarding the program's ability to provide value for money to the Canadian government and, indeed, whether the program is still effective and relevant in the current strategic environment.

Perspectives on the MSP

Opinions on the overall effectiveness and the necessity of the MSP are mixed. Proponents point to the progress of Canadian firms in terms of modernization, expansion of operations and the creation of export opportunities since the outset of the program. It can be argued that economies of scale may not necessarily be achieved by offshore producers in procurement deals due to mitigating factors such as the obstacle of the adherence to Canadian munitions specifications. The MSP program also offers other benefits such as the potential for technology spillovers that may result from when contracted firms offer Canada an opportunity to join a development project initiated by a branch in another nation.

Criticisms of the MSP, in particular the 2007 Chief of Review Services (CRS) report, point to a variety of areas where the program has performed poorly and provided questionable value for money. As well, the international political climate has changed drastically

since the inception of the MSP in the late 1970s: the current reality indicates decreased demand for munitions and that security of supply and the demonstration of productive capacity are no longer overriding considerations. Even if such policy goals were still considered of prime importance, the MSP cannot be said to have reached its goals of providing domestic self-sufficiency in key ammunition markets: suppliers are still dependent on foreign firms for technology and intermediate inputs in the production process, while some "higher-technology" munitions, mostly for air and naval forces, are produced entirely by foreign manufacturers. The CRS report argues that these deficiencies leave Canada exposed to the same risks as though all munitions were procured offshore.

Proponents of the program in its current form point to measures that are underway aimed at improving MSP program delivery, such as a movement towards obtaining 3rd-party advice on procurement initiatives and efforts made to apply Industrial and Regional Benefits (IRBs) more rigorously.

The MSP as Franchise Monopolies

The MSP can be viewed as a group of franchised monopolies in well-defined bundles allocated to contractors. Since they have primarily supplied the Canadian Armed Forces (CAF) at a cost-plus basis without worrying about competition and global markets, their production runs have tended to be shorter than what can be considered optimal. In general, under these natural monopoly conditions, i.e. unexploited scale economies, market competition could lead to market failure by a wasteful duplication of production capacities, each with short production runs. As opposed to *market competition* as a means to control these monopolies, the concept of *competition for the market* can be considered, and three methods have been used in practice: auctions, negotiations and the so-called "beauty contests".

The latter, which has been used under the MSP, is essentially the awarding of a monopoly franchise via negotiations based on predetermined criteria. Historically, the acquisition of MSP franchises by third party firms cannot be considered to have been hostile in nature.

The MSP uses long-term umbrella agreements (Strategic Source Agreements or SSAs) to define the framework of the long-term relationship between the government and the industry participant while adjusting the demand, costs and prices through yearly agreements called Strategic Source Contracts (or SSCs). The CAF demand for mostly army munitions is strictly segmented into four bundles of munitions, each for one of the four contractors: Colt Canada, General Dynamics - Ordnance and Tactical Systems (GD-OTS), IMT and Magellan. These are each, in essence, franchise monopolies as they do not compete. It is, however, clear from the SSAs that the government can induce such potential competition by unbundling or rebundling so that bundles overlap. If contractors accept the challenge, monopolies would become contested. Under recent NATO Standardized Agreements or STANAGS over munitions standardization, this potential competition can be enlarged to include NATO countries' munitions contractors that can produce the same products.

One of the fundamental reasons why the MSP was brought into effect was presumably to secure supplies for surge manufactures as a means to provide munitions that go beyond regular training and exercise needs. This source of demand can no longer be overestimated in the post-Cold War period and, in particular, under NATO standardization practices that may smooth out member country supply fluctuations with multiple countries producing the same munitions.

Moreover, the need for "security of supply" meant that domestic munitions partners would be contractually obligated to have enough excess capacity to respond to surge de-

mand, even if this meant prioritizing the CAF's needs over those of foreign purchasers. In peace time, the contractor could use the excess capacity to export. Noting that significant amounts of MSP contractors' inputs are imported, this interpretation of "security of supply" corresponds to a strong risk-aversion, which is out of line with major allies such as Australia and the United Kingdom.

The CAF's demand consists of that which is associated with regular training and exercise requirements and of the unpredictable peak-load demand due to potential conflict, short of a major international crisis. According to the SSAs, "surge capacity" is a doubling of the base production rate within a six-month period with existing capacity. The MSP costs the taxpayer a premium with two components: first, a retainer because suppliers might choose to produce elsewhere, exploiting scale economies rather than producing domestically; second, the surge capacity sustained induces the peak-load premium. The latter can be alleviated if other domestic sales and exports cover more than the variable costs of production. We first note that the CAF priority will force those sale prices down and, second, exporting requires global competitiveness that may not be stimulated under the current form of the MSP. Given that the duration of SSAs seems to have settled to five year periods and the yearly fixed-price contracts determine the prices, quantities and quality, there doesn't seem to exist a sufficiently long regulatory lag for contractors to realize profits from cost-reduction efforts towards global competitiveness.

The fixed-price annual regulatory contracts cover bundles of munitions products. This generates a common cost attribution problem which normally allows contractors to realize extra "normal" profits by shifting common costs even if bundle prices are set equal to true economic costs. Moreover, the bundle price deprives the regulator of using exogenous yard-

sticks for individual products, i.e. prices for the same products on global markets. This is especially true under the NATO standardization initiative.

Contractors may shift significantly large fractions of their costs into "overhead pools" and reallocate them to individual products using various formulas. Per Rogerson (1994), "By shifting one dollar of overhead away from a competitively priced defense program or a purely commercial product selling at a competitively determined price and onto a sole source defense product where price is set equal to accounting cost, a defense firm could raise its profit by one dollar." This profit, unlike profits obtainable through regulatory lags, does not stimulate competitiveness through cost-reduction efforts.

This lack of incentives towards global competitiveness may be the reason why MSP contractors have failed to become major exporters compared to some other allies' munitions industrial bases, such as Norway's Nammo, which has achieved the same goal during the past decade. Moreover, another reason may well be the fact that MSP contractors produce licenced products and, in particular, GD-OTS and Colt Canada are subsidiaries of GD and Colt USA.

The Munitions Supply Approaches of Australia and the United Kingdom

The munitions policies of two countries, Australia and the United Kingdom, are examined for possible comparisons to the Canadian experience.

The Australian case study provides an interesting perspective on Canadian policy, especially with respect to the reported security of supply concerns. Based on rough, aggregate numbers, Australia pays up to 270% of normal munitions costs simply to maintain domestic capabilities for 20 to 30% of its total munitions requirements. Such a high figure may however be justified given the country's rather isolated geographic location. This does bring

about the question as to whether it is worthwhile for Canada to pay a premium for domestic production when other sources can be secured. Another issue brought to light in the Australian comparison is that the government is auctioning off the right to operate their domestic manufacturing facilities to industry participants - a practice that is in contrast to Canada's policy of awarding monopolies to preferred firms.

The case of the United Kingdom is significantly different from either that of Canada or Australia given the size of the domestic munitions market and the maturity of its production capabilities. Despite this, some important aspects of the United Kingdom's approach to munitions industrial base management deserve a closer look. In particular, the MoD has identified a range of munitions for which the country has a comparative advantage in production, and further identified which munitions products can be procured offshore with only limited effects on operational liabilities, therefore arranging manufacturing priorities towards what can be produced most efficiently while maintaining security of supply as much as possible. Perhaps more interesting, however, is the Ministry of Defence's (MoD) adoption of a combination of smaller munitions stockpiles with a contract-enforced guarantee of manufacture surges which is levied upon both domestic and foreign munitions partners and used in the event a large number of munitions are needed on short notice.

Conclusion

The above analysis of the Munitions Supply Program brings about a clear conclusion: the program is outdated and a new direction is necessary. Four policy suggestions are offerred that would improve outcomes through the introduction of competition in munitions within the MSP framework.

The first policy suggestion is an easy-to-implement, short-term measure with deep long-

term consequences. It involves injecting competition into the market for CAF munitions items by auctioning off a given product that is currently bundled and that can be produced by another contractor.

Another way of implementing this policy would be by dual-sourcing the same product and hence implementing yardstick competition. Evidently, the former modification introduces competition *for the market* whereas the latter introduces competition *in the market*. Dual-sourcing must be complemented by a mechanism to reward cost savings by reallocating purchase quantities towards the more efficient contractor over time. The product-auctioning approach would inflict auctioning costs whereas dual-sourcing could raise production costs simply because the competing contractors' production runs would be shortened. This policy may, at least in the short run, induce lower prices and, by introducing competition in some form, have desirable long-term consequences of enhancing efficiency and, as a consequence, boost exports and undo the scale problem felt especially in the dual-sourcing form of competition. This policy change can also prove experimental and may easily be reversed in case of disappointing outcomes and, alternatively, gradually expanded in case of better outcomes.

The second policy suggestion would be a further step towards competition by endogenizing the bundles assigned to contractors. The current bundle structures are predetermined and thus inflexible as they are not awarded competitively. Since contractors are producing bullets, propellants and explosives, the bundles can be endogenized without new entry. Any one of the three known mechanisms for awarding monopoly franchises, namely auctioning them off, through negotiations, or through "beauty contests" (negotiation by predetermined rules), can be used to redraw the bundle boundaries with cost minimization and export capabilities as the prime objectives.

The third policy suggestion requires revisiting a strategic aspect of the current MSP, namely its definition of "surge" and the related excess capacity requirement. Since munitions demand for training and exercises is fairly stable and thus predictable, the surge capacity can be replaced with a combination of somewhat larger stocks and strict contractual obligations rather than incurring the cost of maintaining an unused domestic surge capacity.

The fourth policy suggestion may hinge on Canada's free trade agreement with the European Union. Recently, various European defence procurement initiatives, combined with NATO's standardization initiative, have generated progress towards a more competitive European armaments market. If Canadian contractors gain access to European markets and are also exposed to European competition in the domestic market, the CAF's demand for munitions can be met at lower program cost. Large European suppliers like BAE Systems, Rheinmetall and Nammo, some of whom already supply the CAF with other equipment, may compete for individual munitions or whole bundles, or simply bid for franchises.

The fifth policy suggestion is based on the observation that SSCs may, by expropriating the profits based on the contractor's cost-reduction effort, be undermining incentives for cost reduction and hence efficiency improvements conducive to comparative advantage and access to global supply chains. A few options exist: fixed-price contracts may be indexed to exogenously-given input prices and comparable world product prices (which would require unbundling); the resulting profits can be shared through an incentive contract or the regulatory lag can be increased upward from one year. Contractors would thus be rewarded for cost reductions and could gain access to global markets.

Contents

1 Introduction

The Munitions Supply Program (MSP) consists of a group of government-franchised monopolies contracted by Public Works and Government Services Canada (PWGSC) on behalf of the Department of National Defence. General Dynamics, IMT, Magellan and Colt Canada are currently the munitions contractors each holding a monopoly over a non-overlapping set of munitions products. The franchises are not permanent but governed by renewable contracts with terms varying from 2 to 6 years. The industry's contribution to the economy is significant, being estimated at $1,597.5M for the 2011 calendar year.[1] This sum is divided into domestic sales of $942.5M (or 59% of total) and foreign sales of $655M (41% of total). When compared to the two other top-three defence industries in Canada, the decomposition between home and foreign sales is markedly different; the aerospace industry's domestic sales account for 38% of its total, with 62% going offshore, while the breakdown in Armoured and Specialized Military Vehicles is 23% and 77% respectively. This is not unexpected given that the MSP represents a long-standing defence policy requirement similar to that of many other countries, though with variations at the margin where different countries impose domestic manufacturing capabilities in narrower or wider scopes of munitions.

The unique structure of this industry brings about two groups of policy questions. The first pertains to the security of supply vision that drove the MSP by requiring domestic production of mostly army munitions but may be perceived as very different in the post-Cold War period. The imposed domestic structure of the industry, its organization and resulting incentives, and the retainer premium are analyzed in detail. The second covers the

[1] KPMG (2012a).

contractual issues related, in particular, to the priority of supply and the implied requirement of a surge capacity which, in turn, generates a peak-load premium.

This report also examines the experiences of countries that are in some ways comparable to Canada. The countries selected for this analysis are Australia and the United Kingdom, which are apt choices as they represent a significant range of industrial capabilities and policy perspectives. Further, while Australia has a relatively small scope in terms of its defence industrial base, the United Kingdom produces a wide range of defence equipment and is particularly active in the export market.

The second group of policy questions pertain to the regulation of an already mandated domestic munitions production base. The discussion in Section 4 addresses specific questions regarding competition and market structure in the industry, such as the types of tools used in assuring security of supply including retainers and peak-load premia, common cost problems deriving from the naturally multi-product nature of manufacturers and, finally, longer-term issues like innovation and promotion of exports.

The study is structured as follows. Section 2 offers a wide-ranging look at the Munitions Supply Program, with a description of the historical beginnings of the program, its key policy aspects, and the outcomes initially expected of these policies. A detail of the developments within the Canadian munitions industrial base follows, along with brief profiles of each firm currently participating in the MSP. Section 3 examines different perspectives on the Munitions Supply Program, in particular those offered within the 2007 Chief of Review Services Report, while also looking at arguments in favour of the program. This section concludes with a description of measures currently afoot aimed at improving MSP program delivery. Section 4, meanwhile, provides an analytical and comparative discussion of several

pertinent policy aspects of the MSP. Section 5 investigates the approaches of selected nations Australia and the United Kingdom to the management of their domestic munitions industrial bases, while further offering comparisons to Canadian policy. Finally, Section 6 details the policy implications arising from this analysis, offering insight into potential courses of action.

2 Munitions Supply Program Review

First introduced in 1978, the Munitions Supply Program was initially aimed at addressing a multitude of inherent risks and deficiencies in the Canadian munitions industrial base; in particular, due to the political context of the time, there existed a desire to ensure the security of supply of high-volume munitions in the event of sustained conflict. The MSP has had successes in some areas such as the modernization of production operations for a number of key facilities and the increased competitiveness of Canadian munitions firms. Recently, however, important questions have been raised in government-sanctioned reviews regarding the program's ability to provide value for money to the Canadian government and, indeed, whether the program is still effective and relevant in the current strategic environment.[2]

This section provides a brief overview of the MSP, beginning with the contemporary issues leading to the emergence of the program and the policy aspects it intended to address. Significant changes and developments in the Canadian munitions industrial base over the 35 year history of the program are then discussed, paying particular attention to the effects of the policy implications of the MSP. Facts and figures pertaining to the Canadian munitions industrial base, including a detailed description of MSP participants and ammunition products purchased under the program, follow in turn.

2.1 The Emergence of the MSP

Prior to the introduction of the Munitions Supply Program in 1978, the munitions industrial base in Canada consisted of a patchwork of government-owned and operated and privately-

[2]A dscussion of the criticisms of the Munitions Supply Program, in particular those levied within the 2007 Chief of Review Services report, is presented in Section 3.

owned facilities, with no comprehensive governmental industrial policy in place to assure security of supply or the development of domestic industry. Domestic manufacturing operations at the time largely employed dated, World War II-era production technology, and had little in the way of incentives to innovate or opportunities for export. Perhaps not surprisingly, munitions were often sourced from foreign firms as the Department of National Defence and the Department of Supply and Services (now PWGSC) had then employed a policy of lowest-initial-cost procurement.[3]

Several important factors are likely responsible for the emergence of the MSP. From the perspective of industry, domestic munitions manufacturers faced substantial uncertainty with declines in year-to-year government purchases and changing needs in ammunition requirements leading to heightened production costs. With the continued use of dated production technology, refits or other changes to assembly operations were especially costly, and prevented manufacturers from achieving the desired economies of scale needed to produce at a sufficiently low cost; this had the further implication of impeding the competitiveness of firms on the international scene and therefore limiting opportunity for export.

The domestic supply of munitions was viewed as being a key policy goal in the contemporaneous political context for a variety of reasons. Firstly, it seemed especially likely that in the event of a potential escalation of conflict against the Warsaw Pact, relying on foreign firms for imports of munitions and munition components would be imprudent as they would be liable to prioritize their own government's needs, particularly in the case of Western European nations. Secondly, an important consideration during this era was the demonstration

[3]Office of the Auditor General of Canada (1988). This policy is so named due to the fact that it considers only the initial cost of procurement; through-life costs were not included.

of industrial capability and the *perception* of Canadian munitions manufacturing capacity as a means to sustain NATO allies in the event of sustained conflict.

2.2 Policy Aspects of the Munitions Supply Program

The Munitions Supply Program was implemented in order to address these issues to a great extent by increasing the cohesion between government and industry. Firms would be offered preferred supplier status, and partnership in the MSP,[4] provided they were identified as having sufficient productive capacity for critical munitions items. This partnership had several requirements that each firm had to abide by, notably: (1) meeting the ammunition requirements as identified by the Department of National Defence in terms of quantity, quality, technical suitability and time frame; (2) the prioritization of government procurement over export contracts; (3) the use of Canadian inputs wherever possible; and (4) offering competitive prices to the Canadian government.[5]

The "preferred supplier" status, in turn, had several implications for participating firms. While the government could technically subject procurement contracts to international competition, this was rarely ever done in practice,[6] thus allowing firms to obtain contracts despite not necessarily producing at the lowest possible cost to the government.[7] As well, in order to stabilize production requirements levied upon firms, long-term supplier deals were put

[4]The MSP first targeted six Canadian manufacturers: Bristol Aerospace, Diemaco, IMT Corporation, Canadian Arsenals Limited (CAL), Valleyfield Chemical Products (VCP), and Industries Valcartier, Inc. (IVI).

[5]See Section 4 for a comprehensive analysis of the objectives of the MSP and their feasibility.

[6]This is in contrast to policies adopted in Australia, where defence procurement contracts are regularly competed. See Section 5.1.

[7]It was hoped that firms could improve their productive processes and become more competitive in the long-run. There is also an inherent tradeoff between lower costs of munitions items and the policy goals identified by the Canadian government, notably the security of supply during times of conflict.

into practice, wherein key munitions needs for each participating firm would be identified in advance over a lengthy time horizon.[8]

Partnership within the MSP also meant that the government would implement measures as a means to either improve the efficiency of, or directly support, participating firms. For instance, in order to deal with the aging production processes of a number of participants and mitigate the costs arising from these inefficiencies, the government offered loans to assist in plant upgrading and modernization. The government would also offer financial support to assist industry in expanding product lines and reaching export markets so as to allow these firms to achieve better economies of scale in the long run.

Another policy goal of the MSP involved the privatization of Canada's government-owned munitions facilities. Before any official munitions industrial base policy had been implemented, a wave of privatizations was underway, with Canadian Arsenals Limited (CAL) selling off three of its five production facilities to private interests. This continued with the introduction of the Munitions Supply Program, with CAL's remaining operations - the plant at Le Gardeur, QC, and the recently-opened metal parts manufacturing facility at St. Augustin, QC - sold to SNC Lavalin in 1986. Private firms continue to own and operate all facilities involved in the MSP to this day.

A crucial aspect of the MSP involved allowing for the potential failure of participating firms. In a vacuum, such a policy would be expected to drive MSP participants to achieve greater efficiency and to explore opportunities in foreign markets, decreasing reliance upon government demand, as a means to ensure continuity of operations. The history of the

[8]The 2007 CRS Report specifies that 5-year contracts were used, with two years being firm and the remaining three used for planning purposes (Chief of Review Services (2007)).

program, however, has instead demonstrated a preference for government intervention. While the MSP explicitly brought with it no guarantees of bailout or financial support in the face of bankruptcy, it is clear that, given the key munitions needs identified by the government at the outset of the program, such measures would ultimately be taken - and, indeed, have occurred in practice. The energetic materials plant at Valleyfield, for instance, had suffered significantly from underinvestment over a long period of time, even failing to innovate on its World War II-era production technology due to expectations the plant would close. However, even after privatization, the government stepped in to ensure operations would continue on several occasions, until landing in the capable hands of SNC TEC and undergoing significant modernization efforts.[9]

2.2.1 Program Expectations

In addition to the more obvious goals of ensuring security of supply and stabilizing the Canadian munitions industry, these MSP initiatives had other policy goals in mind.

The MSP program was fashioned on an economic model of government / industry co-operation not unlike that of a classic infant industry, import-substitution approach. In this regard, it was expected that in the long run, Canadian firms would achieve economies of scale comparable to international competitors and therefore be able to offer the Canadian government better prices while benefiting from a wider scope of production. This would have the further effect of decreasing reliance on alternate sources of munitions in terms of competition and the provision of intermediate inputs into the production processes of domestic firms. Once domestic manufacturers reached such a point of maturity, whatever divergences

[9]The plant, owing to the sale of the munitions portion of SNC's defence portfolio, is now run by General Dynamics.

in price as compared to international munitions suppliers that still existed could be justified as an acceptable cost in light of the ability to provide uninterrupted supply in times of conflict and the benefits accruing to Canadian industry in terms of development and spillover effects.[10]

2.3 Developments in the Canadian Munitions Industrial Base

The Canadian munitions industrial base has changed considerably since the inception of the MSP, both as a direct result of MSP initiatives and due to exogenous factors such as the international political climate and market conditions.

2.3.1 Privatization

As explained previously, all munitions facilities owned by the Canadian government at the outset of the MSP have since been privatized. The result of this effort has been viewed positively by observers; in an extensive and detailed study, authors Hix et al. (2004)[11] point to increased profitability and competitiveness on the export market as signs of a successful privatization initiative. SNC-Lavalin's munitions production operations,[12] which constituted the vast majority of all MSP production, showed increasing profits over the course of the late 90s and early 2000s. Further, the proportion of time spent on production for foreign clients increased exponentially over this same period, eventually accounting for a majority of all production hours. Despite these apparently positive results, it is difficult to determine whether these increases in foreign sales are uniquely due to a greater outward focus caused

[10]The concepts of retainers and peak-load premiums are discussed in Section 4.2.1.

[11]These authors made extensive use of an analysis on Canada's Defence Industrial Base carried out by Solomon (1999).

[12]These have since been sold to GD-OTC.

by private entrepreneurship. It seems entirely plausible that the increase in foreign sales over the identified period is due to exogenous factors, in particular the beginning of the war on terror of the early 2000s and subsequent military deployments in Iraq and Afghanistan.

2.3.2 Modernization of Operations

The drive towards privatization required a great deal of investment on the part of the government in order to modernize plants with dated production processes that had been in use for the better part of a century, as it seemed unlikely that private firms would be interested in purchasing these facilities in their current state and having to undertake such expansive remodelling themselves. The initiative to modernize production facilities is exemplified in the case of the Le Gardeur plant, then owned by the Canadian Arsenals Limited crown corporation. In the years 1978 to 1985, the facility underwent significant modifications, which contributed towards turning annual losses into profits in a short time frame. By the time the plant was to be privatized in 1986, several bidders were interested in the facility.[13]

2.3.3 Changes in MSP Contracting

The contracting methodology between government and industry in munitions sourcing at the outset of the MSP was largely based on a "cost-plus" approach,[14] and included significant profit protection for firms. Not surprisingly, such a methodology created little in the way of incentives for increased productivity on the part of the firms, an arrangement that held little benefit for either participant. Once the Cold War ended, decreases in government buys meant that firms needed increased export revenues in order to continue to operate efficiently and

[13]The plant was ultimately acquired by SNC-Lavalin.
[14]Hix et al. (2004), Office of the Auditor General of Canada (1988).

provide reasonable prices to the government. The cost-plus contracting approach, however, did little to encourage firms to ramp up production capabilities and achieve economies of scale. To this end, the government and SNC[15] agreed to new contract vehicles in order to properly incentivize improvements in productivity.

2.3.4 Political Developments

With regard to exogenous factors, changes in the political climate have indeed played a role in the development of the Canadian munitions industry. While the MSP was founded in the context of the Cold War, where demonstration of industrial capability was a primary concern, the current focus of the Canadian military is on supporting smaller-scale deployments and dealing with asymmetric threats.[16] As such, munitions manufacturing has moved more towards providing for training purposes rather than assuring an ability to produce a high volume of munitions. Recognizing this fundamental shift, NATO allies have altered their own munitions procurement methods away from domestic production and more towards cost-effective sourcing, thereby demonstrating an increased willingness to accept risk in security of supply.[17] Canada has not followed this trend, at least with respect to the munitions industry, instead opting to continue with its current munitions industrial base policy.

2.3.5 MSP Participants

In terms of participating firms, the MSP has evolved from consisting of six Canadian manufacturers, of which the majority of production facilities were government-owned: Bristol

[15] At the time, SNC-Lavalin dominated the Canadian munitions market.

[16] Chief of Review Services (2007).

[17] The United Kingdom, for example, made a strategic decision in recent years not to subsidize their domestic propellant industry as it provided questionable value for money, instead relying upon increased stockpiling as a form of risk mitigation (Chief of Review Services (2007)).

Aerospace, Diemaco, IMT Corporation, Canadian Arsenals Limited, Valleyfield Chemical Products, and Industries Valcartier, Inc., to now only four: Colt Canada, General Dynamics Ordnance and Tactical Systems, IMT Corporation, and Magellan Aerospace (Bristol), where Colt acceded to the program by means of purchasing Diemaco and General Dynamics by means of purchasing the munitions production branch of SNC-Lavalin.[18] Industry profiles of each of these firms are presented in the following section.

2.4 MSP Industry Profiles

The four current MSP participants, Colt Canada, General Dynamics Ordnance and Tactical Systems, IMT Corporation and Magellan Aerospace, are profiled in turn.

2.4.1 Colt Canada

Established after the purchase of Diemaco Inc. from parent company Héroux-Devtek in 2005,[19] Colt Canada produces small arms and small arms munitions. In particular, it is the sole source for the CAF C7 rifle and C8 carbine, which are produced under licence from US-based Colt's Manufacturing Company.[20]

Colt Canada Profile[21]

Location(s)

Kitchener, Ontario: Headquarters and Production Facilities

[18]The SNC facilities consisted of those formerly owned and run by Canadian Arsenals Limited.
[19]Itself having only purchased Diemaco in 2000.
[20]MFRTech (2011).
[21]Detail obtained from Industry Canada (2013a) and Colt Canada (2013). Figures are from Industry Canada and represent approximations.

Employment

100 employees, approx.

Total Sales

25M - 50M CAD

Export Sales

10M - 50M CAD

Munitions Products

Small Arms Munitions

2.4.2 General Dynamics Ordnance and Tactical Systems

Having purchased the munitions production operations from SNC-Lavalin in 2007, the US-owned General Dynamics Ordnance and Tactical Systems (GD-OTS) immediately became the largest and most important MSP participant owing to the large scale of operations and scope of munitions provided to the CAF. In total, GD-OTS accounts for over 70 percent of the conventional ammunition production for the Department of National Defence. The company owns four facilities in Québec, including three production facilities, producing a wide variety of munitions products: small, medium and large-caliber munitions, high explosive (HE) munitions, and a variety of reduced energy and short range training munitions, to name only a portion of their entire product line.

General Dynamics Ordnance and Tactical Systems Profile[22]

[22]Detail obtained from Industry Canada (2013b) and General Dynamics Ordnance and Tactical Systems Canada (2013). Figures are from Industry Canada and represent approximations.

Location(s)

Repentigny, Québec: Head Office; Load, Assemble and Packing Plant

St-Augustin-de-Desmaures, Québec: Metal Forming Plant

Valleyfield, Québec: Energetic Materials Plant

Nicolet, Québec: Proofing, Testing and Evaluating Site

Employment

1450 employees, approx.

Total Sales

100M - 250M CAD

Export Sales

50M+ CAD

Munitions Products

Small, medium and large-caliber ammunition, reduced-energy ammunition, Short-range ammunition, non-toxic projectile, non-toxic primer, frangible ammunition, propellants, propelling charges, fuzes, brass cartridge cases, demolition devices, grenades, pyrotechnics

2.4.3 IMT Corporation

Founded in the early part of the 20th century, IMT Corporation is one of two current MSP manufacturers to have remained within the program since its inception without changing hands. The company produces a wide range of products, including munitions for air and naval defence, as well as artillery, mortar, tank and anti-tank shells. In addition to being

a preferred supplier under the terms of the MSP, IMT earns substantial revenues from its many overseas export clients.

IMT Corporation Profile[23]

Location(s)

Ingersoll, Ontario: Headquarters and Production Facilities

Employment

375 employees, approx.

Total Sales

50M+ CAD

Export Sales

25M - 50M CAD

Munitions Products

Naval: 57mm BLP, 57mm PFHE, 57mm NFVT, 3" – 50 HE (MK33), 3" – 70 HE (MK34), 5" – 54 HE, 5" – 54 BLP

Air Defence: 35mm TP-T, 35mm HE-I

Artillery: 105mm M1 HE, 105mm M84HCBE (Smoke), 105mm M314A3 (Illuminating), 105mm LPG2 HE (Extended Range), 105mm M913/M927 (Extended Range), 155mm M107 HE, 155mm M116 (Smoke HC), 155mm IM485A2 (Illuminating), 155mm M110A2 (Smoke WP)

[23]Detail obtained from Industry Canada (2013c) and IMT Corporation (2013). Figures are from Industry Canada and represent approximations.

Mortars: 60mm HE, 81mm HE

Tank and Anti-Tank: 76mm SHP, 76mm HESH, 84mm TP/T, 90mm HE-T M616A1, 105mm SH C72, 105mm TP/FSDS C71, 105mm APFSDS C148

Designated Products [24]

Land Direct Fire Ammunition: 84 mm Carl Gustav - TP-T, 105 mm for Leopard C2 - APFSDS-T, SRTPDS-T, HESH-T, SH/P/T

Land Indirect Fire Ammunition

60mm Mortar HE, 81 mm Mortar HE, 105 mm Howitzer - HE, Smk, Illum, 155 mm Howitzer - HE, Smk, Illum

Naval Ammunition: 57 mm BL/P, PFHE, NFVT and TRAP

2.4.4 Magellan Aerospace (Bristol)

Bristol Aerospace, an operating division of Magellan Aerospace, is another firm to have remained a MSP participant since the inception of the program. Specializing in aerospace systems, Bristol currently supplies, or has agreements to supply, components for various aircraft such as the Airbus A380, the F-35 Joint Strike Fighter as well as other components for helicopters and tanks.

Bristol Aerospace Profile[25]

Location(s)

Winnipeg, Manitoba: Headquarters and Production Facilities

[24] As identified in the DND-IMT Strategic Source Agreement, 2012.

[25] Detail obtained from Industry Canada (2013d) and Magellan Aerospace (2013). Figures are from Industry Canada and represent approximations.

Employment

600 employees approx.

Total Sales

50M+ CAD

Export Sales

50M+ CAD

Munitions Products

Rockets, propellants, specialized explosives and warheads

Designated Products [26]

Rocket Systems: 2.75 inch (70mm) - CRV7 C14, CRV7 C15, Black Brant suborbital (sounding) rocket, Rocket Assist Take-Off (RATO) systems

Warheads: 2.75 inch (70mm) WTU-5001 Practice, WDU-5002 Flechette Anti-Tank

Launchers: LAU-5002 - version B/A, LAU-5003 - versions A/A, B/A, C/A, D/A; SUU-5003 - version B/A

Flares: Pyrophoric Flares; SAR Flare (in Development)

[26] As identified in the DND-MAW Strategic Source Agreement, 2013.

3 Perspectives on the MSP

Opinions on the overall effectiveness and the necessity of the MSP are mixed. Proponents point to the progress of Canadian firms in terms of modernization, expansion of operations and the creation of export opportunities since the outset of the program, while critics point to a variety of areas where the program has performed poorly and provided questionable value for money. This section examines, in turn, the criticisms brought to light in the 2007 Chief Review Services Report and, conversely, several arguments in support of the MSP. The section concludes with an overview of measures currently underway to improve program delivery.

3.1 The 2007 Chief of Review Services Report

The 2007 Chief of Review Services Report questions the relevance of the MSP in today's international political context, whether the program has succeeded in its strategic objectives, and casts doubt on the program's prospects for future success. The most pertinent criticisms identified within the Report are briefly summarized in this section.[27]

Present-Day Relevance of the MSP

Citing changes in the international political climate, demand for munitions are noted within the Report to have dropped considerably over the observed period. During peak periods in the 1980s, munitions expenditures reached up to 300M$ in a given budget year; these numbers have since dropped off considerably, with a total of 185M$ in such spending

[27]For the purposes of brevity, some aspects of the Report are omitted from this section. More detail can be obtained from the Report itself.

in 2005,[28] while Canada was involved in operations in Afghanistan.

The munitions planning environment has accordingly experienced a marked change since the Cold War era. As mentioned, previous munitions production strategy had a focus of being able to demonstrate capacity and productivity to NATO allies, and government buys remained relatively stable from year to year. In today's environment, the CRS Report notes an emphasis on the ability to deal with asymmetric threats and a desire for more precision-oriented weapons. These factors contribute to increased volatility in the demand for munitions, with decreased overall purchases over the long run.

Perhaps the most important point brought forth within the 2007 CRS Report with regards to the current relevance of the MSP is that Canada's relatively small defence market and military requirements are insufficient in terms of being able to support an industrial base capable of sovereignty of supply in key munitions needs.[29] Even with the government's continued support via the MSP, the munitions industry is dependent on technology and inputs brought in from offshore sources. Further, virtually all sea and air ammunition are currently purchased abroad.

Lack of Success in Achieving Strategic Outcomes

The Report also calls into question the ability of the program to produce the strategic outcomes that had been identified since its inception. Self-sufficiency in the munitions industry has by all accounts failed to materialize: MSP suppliers are largely dependent on foreign firms for technology and intermediate inputs into the production process. This issue, the Report alleges, leaves the DND and the CAF open to similar risks as though munitions

[28]The Report indicates these are budget-year dollars, meaning the money spent is valued in then-year dollars. The divergence, given the differences in real values of the Canadian dollar between the 1980s and 2005, is actually greater than these numbers suggest.

[29]This fact is highlighed in a report on Canada's defence industrial base by Solomon (1999).

were simply procured offshore in their entirety. There is also little in the way of objective evidence to suggest that the munitions industry would be able to react effectively to the DND / CAF needs under various "contingency scenarios".[30]

In terms of aiding the development of the Canadian munitions industry, the Report does acknowledge some of the aforementioned positive developments. However, it cites real concerns with regards to the ability of the Canadian munitions industry to be financially viable and competitive, absent such extensive government support.

Overall Assessment and Alternatives

Given these criticisms, it is perhaps not surprising that the Report does not express much confidence in the future success of the program given current policies, stating: "It is unlikely that the program performance will improve if the MSP continues on its current path".[31] By the authors' estimation, government bears the brunt of the risk with respect to sustaining the domestic munitions industry, with bailouts of failing firms having occurred in the past. This apparent willingness to assume virtually unlimited financial risk is cited as a policy that cannot continue without adequate controls and oversight if the program is expected to be successful in the future. The Report is further critical with respect to the program's ability to provide value for money, though proper evidence to make this assertion clear are currently lacking due to deficiencies in MSP metrics.

Potential alternatives discussed within the Report include open competition in procurement of conventional munitions, maintenance of the status quo of protecting domestic industry, or some combination of the two. Risk mitigation strategies that can complement

[30] These scenarios are not described in detail within the Report, but appear to refer to time-sensitive events and developments requiring quick changes in munitions production and provision.

[31] Chief of Review Services (2007).

such approaches include stockpiling of munitions according to needs and maintenance of a domestic industrial capability, allowing for constant provision of training needs and the possibility of increasing production in the event of unanticipated increases in demand.

The Report concludes that the future of the MSP should be decided in the light of further analyses. In particular, the determination of strategic requirements for conventional ammunition and insight into which alternatives would best suit these requirements, and an analysis of the ability of Canadian industry to meet government needs in terms of price and scope of operations. Importantly, the Report asserts that if such analyses determine that the MSP's goals remain the same, then improvements to "all facets of (...) design and delivery" are needed.[32]

3.2 Arguments in Favour of the MSP

This section describes competing perspectives that provide support for current MSP management policy in light of the criticisms levied within the 2007 Chief Review Services Report.[33] Measures currently underway to improve program performance are also explained.

Foreign Producers of Munitions May Not Necessarily Be Cheaper

In most ammunition markets, foreign manufacturers are unable to offer "fully competitive" prices to the Canadian government. The reason for this is that Canadian needs are simply not enough to allow these manufacturers to achieve economies of scale necessary to produce at the required level of efficiency. Only in cases where a firm is already producing a given munitions type – ostensibly for another government – would they be able to operate

[32]Chief of Review Services (2007).

[33]The perspectives described herein have been obtained from interviews with PWGSC officials.

at a level such that there would be cost savings on the part of the Canadian government.

The story does not end there. It is not enough to show that a manufacturer can produce a needed munition type at a given price; it must be established that the munition meets all criteria put forth by the DND in ensuring that it is suitable for use by the CAF. The criteria can include metrics such as lifespan, durability, effectiveness in extreme temperatures (of particular importance given the nature of the Canadian climate), and others. Such a process requires a substantial amount of time, and the overall costs associated with this are not trivial. This process may thus have the effect of preventing or otherwise dissuading potential offshore manufacturers from competing for contracts.

Having a domestic capability for munitions eliminates a great deal of these issues, as munitions can be designed "from the ground up" for use by the CAF. This also allows for modifications to the munitions to occur more quickly than would likely be possible for foreign firms to achieve.

This does not concede, however, that MSP manufacturers are not able to provide competitive prices to the Canadian government on their own merits. The case of the Close Area Suppression Weapon (CASW) munitions is an example of a procurement process wherein it is thought that significant savings were made via the use of a Canadian manufacturer over the competing offshore firm Rheinmetall. This reportedly resulted in savings as high as 39%,[34] while 40 full-time jobs were created domestically.

Security of Supply Risks May Be Exaggerated

An important point within the 2007 CRS Report pertains to the problem of high-

[34]It is not clear, however, if this figure takes into account other costs to the government such investments and other transfers.

complexity munitions, such as those used in submarines or aircraft, being exclusively imported. This dependency, it is argued, leaves the Canadian government open to similar risks as though all munitions were procured offshore. Proponents of the MSP refute this claim as the high-complexity munitions that are imported consist of only a tiny percentage of the entire munitions needs of the CAF and are not needed in high volume. Submarine munitions, for example, are only needed in very small amounts, and are recycled whenever possible. Furthermore, these types of munitions are almost exclusively expected to be used in training exercises, with little likelihood of an increase in demand even in the event of conflict.

Conversely, it should be noted that while these high-complexity munitions do only account for a tiny percentage of all CAF munitions requirements, their financial impact is large relative to other munitions types, with individual unit costs reaching over 1 million CAD in some cases. This provides support for the perspective underscored within the 2007 CRS Report.

Other Benefits of the MSP

It can be argued that the MSP offers other benefits that are not explicitly covered within the 2007 CRS Report. One such benefit is the potential for technology spillovers from MSP manufacturers who develop munitions for other nations, the United States in particular. When new munitions types are being researched elsewhere, the Canadian government may be offered an opportunity to participate in the development process. In such instances, the CAF would be privy to earlier access to a needed munitions type at a potentially lower price than would otherwise be possible, and further, Canadian industry would be able to produce these munitions, allowing for greater domestic capabilities and perhaps creating further opportunities for export. A counterpoint to this logic is that innovations are more

likely if manufacturers are exposed to global supply chains, whereas MSP contractors may not be fully exposed for two reasons: (1) average cost pricing may be applied too loosely and (2) contract renewals may not be tendered competitively, as in other countries such as Australia.[35]

3.3 Measures Taken to Improve MSP Program Delivery

As of this writing, there are no major movements afoot to either drastically alter the status quo of MSP program design or implement far-reaching reforms. This is not to say that it is believed that the program performs perfectly; it is thought that a great deal of improvement can be made, especially with regard to issues arising from inaccurate anticipation of ammunitions needs on the part of the Department of National Defence.

One of the main reasons the MSP was implemented in the first place was to address a need for better coordination between industry and government; as described, Canadian munitions manufacturers had faced a great deal of variance in year-to-year buys and insecurity prior to the start of the program. The introduction of the MSP brought with it the use of long-term contracts, where munitions needs over the first two years were considered to be firm. In practice, however, changes to projected munitions needs, even over the very short term, fluctuate frequently, often resulting in changes to purchase orders beyond firm contractual deadlines. As MSP firms are required to respond to government needs, there is little recourse for manufacturers under such circumstances.

A recent movement towards 'smart procurement', however, is expected to help bridge

[35]These two issues are discussed further in Section 4.

this gap between government and industry. The tenets of this approach are as follows:[36]

- **Early Engagement:** Improving industry involvement in munitions planning phases.
- **Effective Governance:** Ensuring effective management and communication procedures throughout the munitions procurement process.
- **Benefits for Canadians:** This deals mainly with the application of Industrial and Regional Benefits. At present, offset requirements are not applied with the same rigor in offshore munitions procurement as they are in other offshore procurement initiatives. While a total of 100 percent of a contract's value is expected to be returned in offsets, the amount returned in munitions contracts has reportedly fallen closer to 20 percent.
- **Independent Advice:** The involvement of third-party experts in the munitions planning process as a means to help identify problem areas well in advance and to ensure that order deadlines are properly met.

[36]Brownrigg (2013).

4 The MSP as Franchise Monopolies

This section concentrates on four specific questions on the MSP: first, competition and market structure in the industry that follows from franchise monopolies;[37] second, instruments used in assuring security of supply such as retainers and peak-load premia; third, common cost issues naturally arising in multi-product industries; and, finally, longer-term issues like innovation and promotion of exports.

4.1 Market Characteristics

Despite worldwide consolidations of suppliers in the post-Cold War global defence markets,[38] individual manufacturers in small markets continue to operate at such small scales that their unit costs would be decreasing even if their outputs increased significantly. The Canadian MSP output composition, with domestic sales of $942.5M (or 59% of total) and foreign sales of $655M (41% of total)[39] suggests, with a relatively small proportion of exports, that the four contractors could reduce their unit costs by expanding their outputs. In fact, it seems likely that such cost savings could subsidize a new policy initiative to expand their access to global markets and still leave the DND with lower munitions costs.

This type of policy would be an example of horizontal support to an industry[40] - instead of vertical or direct subsidies to particular manufacturers in the form of relatively generous

[37]The use of the term "franchise monopoly" is correct in the Canadian context as MSP franchises do not compete with one another as their product ranges do not overlap. If such an overlap existed, competition would be possible. Such a structure would however bring with it the drawback of shorter production runs and overall weakened natural monopolies.

[38]The three consortia bidding to supply the Australian Defence Force (ADF) with munitions is an example of such consolidation (Grevatt (2013)), especially considering that many countries are now supplied by these same international contractors.

[39]KPMG (2012a).

[40]Such support encourages competition by decreasing barriers to entry.

retainers and peak-load premia, the government would target common subsidies such as promotion of export market penetration, R&D support, and human capital investments aiming for personnel inputs into MSP companies (Aghion et al. (2012)). This type of policy abstains from "picking winners" and, even in the absence of competition amongst MSP contractors, encourages exposure to world markets.[41]

4.1.1 Auctioning off a Natural Monopoly

Modern production technologies always exhibit a range over which increasing returns to scale and decreasing unit costs prevail. If accompanied by relatively low demand leading to short production runs, the emerging phenomenon is a natural monopoly in which the introduction of competition may lead to a market failure due to a wasteful duplication of production capacities. Thus, where governments are able to intervene, one potential policy choice is awarding a monopoly franchise to prevent market failure. There are varying methods of determining the industry partners that are to be awarded franchise monopolies. One of these involves auctions, which is currently favoured by the Australian government in selecting their munitions supply partners. Canada, meanwhile, has been using an approach of ongoing negotiations with selected industry partners for the MSP.

Auctioning off franchise monopolies repeatedly is common practice, for instance, at municipal levels for waste collection and within well-delineated geographic boundaries for cable television broadcast licences. The MSP differs from such market phenomena in two distinct ways. First, unlike garbage collection the MSP is a multiproduct industry. Second, unlike either of the examples, it is not vulnerable to periodic competition. This second property of

[41] Aghion et al. (2012).

MSP, combined with a lack of strategic trade incentives or horizontal subsidies,[42] provides a disincentive for MSP contractors to intensify their search for foreign markets.

Franchise monopolies have been successfully used in a variety of circumstances from broadband spectrum to railways (VIA Rail in Canada to partial network franchises in the United Kingdom), roads,[43] bridges, hospitals and prisons. Bidding for such a franchise injects competition into a natural monopoly market structure via repeated tenders or negotiations for the franchise rights and reduces the burden on regulation.[44] This bidding process can be described as an ex ante competition where the lowest bidder would win the right to run the franchise for the specified period. Moreover, if some external competition exists, such as satellite television competing with cable television, the power of the natural monopoly is further diminished. The MSP as a whole, by construction, does not face any competition of this latter sort while, over the years, takeovers seem to have been less than hostile for MSP contractors. In this regard, it will be interesting to follow the 2015 Australian franchise bidding experience for Australia's domestic munitions capabilities as many manufacturers have clearly declared interest in bidding.[45]

A few remarks about tenders are in order. First, a tender, when properly designed and without collusion by bidders, will allocate the contract to the least-cost bidder.[46] Second, the informational requirement on the purchaser hardly exceeds the background information on the market credibility of bidders. The auction itself provides the franchiser with information about the competitiveness of potential suppliers and the costs of servicing the market; this is

[42] Aghion et al. (2012).
[43] Highway 407 in Toronto, for instance.
[44] Borrmann (2008).
[45] Arena and Birkler (2009) discuss whether a transition from sole-sourcing to multiple-sourcing is desirable.
[46] Vickrey (1961).

a property of the *Vickrey* mechanism that ensures potential franchisees bid their true costs.[47] Third, once supply is forthcoming, the franchisee has an incentive to minimize costs unless the franchiser is known to expropriate the profits induced by cost reductions. Fourth, the franchiser has a strong incentive to monitor the quality of the products lest the franchisee skimps on quality. In this regard, the franchiser has an incentive to preserve its "smart customer" capabilities, particularly if bids involve more than just cost.[48] Fifth and finally, setting up and running a franchise auction is costly to the government; safeguards such as ensuring the claimed capabilities of bidders and their financial well-being as well as the government's "smart customer" capability are both costly to establish and maintain.

While auctioning off a franchise monopoly generates costs, so too do the alternatives. For a regulatory regime that monitors prices and quality, both enforcement and renegociation are costly propositions. More importantly, regulation then assumes the difficult task of eliciting cost information that, in a tender, is incumbent upon bidders to reveal.

Since franchise monopolies are awarded for fixed periods of time, some further issues arise. First, long-term contract governance difficulties may indicate that long-term contracts can be replicated by short-term contracts, though these have their own difficulties as well. Since significant changes to demand and cost conditions cannot be ruled out upon the awarding of a franchise, post-bidding period allocation has to be supplemented by regulatory contracts.[49] Recognizing these difficulties, the MSP consists of a long-term umbrella agreement that defines the framework of the long-term relationship with partners while adjusting demand, costs and prices within yearly agreements.

[47] This "true cost" always includes the normal profit margin.
[48] Borrmann (2008), Riordan and Sappington (1987).
[49] Williamson (1976).

Secondly, a potential incoming franchisee may be deterred from investing in transaction-specific assets or, if there are non-transferable important assets, the incumbent will enjoy a significant advantage over potential entrants. Although this particular difficulty is lessened by the NATO standardization of munitions which would enable international contractors to diversify markets, each market will present peculiarities.[50] Finally, the issue that sunk costs may be incurred repeatedly by franchisee rotation is perhaps less severe in standard munitions production, which is the case in Canada's MSP.

4.1.2 Markets and Regulation

The Department of National Defence's demand for munitions is strictly segmented under MSP: there is no overlap in terms of munitions produced by different contracors. Each contractor is therefore a franchise monopoly over a particular bundle of munitions and contractors, by design, do not compete. The Strategic Source Agreements (SSAs) are clear in that the government can, by renegotiating with suppliers, adjust the range of products supplied by each contractor.[51]

A potential policy perspective that can be derived from this observation is whether competition can be induced by unbundling and rebundling munitions production. Specifically, if MSP contractors could bid and encroach on each other's bundles at contract renewals, the market could resemble a spatial monopolistic competition with a fixed number of firms, where only firms with similar or "neighbouring" products would likely compete. Since con-

[50] If not in terms of production conditions, there are surely peculiarities in terms of organizational and behavioural constraints specific to each country, such as planning horizons, standard operating procedures and organizational responses to extraordinary circumstances.

[51] A limitation of this study is that there is no room for analysis of whether the current bundles allocated to the three MSP contractors are optimal in the sense of exploiting potential scope economies, i.e., cost complementarities and positive spillovers. Such an analysis would require expertise in production technologies as well as in cost accounting.

tractors would rather bid on munitions adjacent to theirs without deviating significantly from their core competencies, horizontal overlaps over bundles would arise. This could be coined **'credible contestability'** or, simply, potential competition over a certain product. This credible contestability would require any one of the existing contractors to retool and manufacture the munition product in question. Moreover, this policy approach could even enable a non-MSP firm to bid in case one of the MSP competitors' factories is available and suitable for modification into a multiproduct facility.

This induced competition might have a perverse outcome if unbundling leads to a loss of scope economies without a compensating benefit in terms of cost savings from induced competition for neighbouring products. A potential positive effect of this increase in competition are the scale economies that can be gained by greater penetration in foreign markets. If the incumbent is only producing for the government while a new contractor is already exporting their output, the boost to its scale of production might have the effect of pushing it further along its average cost curve.

4.1.3 Political Constraints

Global munitions markets are highly segmented: not only in terms of technical classifications such as large, medium and small caliber munitions, artillery and mortar rounds, but also in terms of groupings of countries such as the European Union (EU) and NATO and even individual countries that may resist integration to global markets. With respect to the economic implications of political constraints such as alliance membership, increased integration bears fruit for munitions by standardization that implies longer runs in production where scale economies have traditionally existed due to individual country policies of producing

munitions domestically. Naturally, these cost reductions through scale economies are the result of long-term cooperation:

> *"(...) NATO is important here because it acts as an effective mechanism for standardization and interoperability. For decades the original NATO members have conducted exercises together and have standardized their doctrine, equipment and technical procedures through the use of Standardized Agreements or STANAGS, of which there are well over a thousand. Agreed in Brussels and implemented by national militaries, STANAGS facilitate the conduct of a multinational operation. "The benefit of having an Alliance," notes Thompson, "is the standardization of everything from staff and operation order procedures to training, map symbols, bullets and fuel... When you conduct an operation we all talk the same language... The military value of NATO is that you don't have to rediscover these things every time."*[52]

Canada's recent decision in purchasing standard pistols is a part of this long-term trend:

> *"Only pistols chambered for NATO 9 x 19mm ammunition will be considered because Canada is committed to maintaining ammunition interoperability and standardization with its trusted allies and NATO."*[53]

The general trend amongst NATO allies and this latest acquisition in Canada are suggestive of stiffer competition arising due to standardization. The recent history of Nammo, the Norwegian munitions producer that benefited from the relative liberalization of munitions markets and grew exponentially during the Iraq and Afghanistan conflicts suggests

[52]Sloan (2012).
[53]Pugliese (2011).

two directions for Canadian ammunitions policy. First, Canadian MSP contractors must be exposed to international competition that is consistent with current policies of promoting free trade and the impending trade agreement with the EU; further, NATO standardization policy no longer requires tightly insulated domestic production. Second, the weak record of exports by MSP contractors suggests either modifications to the range of munitions they produce or a stronger regulatory regime with export stimulus.

4.2 Security of Supply and Contractual Relationships

Security of supply is the primary reason why many countries have long-term supply contracts with munitions firms. However, security of supply must not be confused with the steadiness of supply that defence forces need for training and exercises; the former is a contingency while the latter is a regularity. Disruption of supply for training and exercises cannot be overestimated especially under the NATO standardization practices that serve to smooth out any supply fluctuations experienced by member nations. In the case of Canada, several important factors are likely responsible for the emergence of the MSP.[54] The industry perspective was that domestic munitions manufacturers faced substantial uncertainty with declines in year-to-year government purchases and rapidly changing needs in ammunition requirements leading to heightened production costs. Therefore, the MSP can be considered an improvement from the point of view of the contractors.

Security of supply is the explicitly stated reason why domestic production capabilities in a range of munitions items have been assured and its modern form in the MSP is preserved. Security of supply in its traditional version is a multidimensional phenomenon. First, it

[54]The full set of factors are explained in Section 2.1.

includes the provision that production must take place in domestic facilities so that they are under the jurisdiction of the government. Second, a costly surge capacity must be maintained. Thirdly, as an imposed contractual obligation, the domestic government enjoys priority over any other purchaser whenever the government needs munitions. In fact, section 9.1 of the Strategic Source Agreement (SSA) with General Dynamics Ordnance and Tactical Systems reads: "Priority" includes the suspension of work on conflicting contracts, regardless of source.[55] Finally, significant amounts of MSP contractors' inputs are imported,[56] mostly from the US. Therefore, there exists another peak-load issue in that in an emergency involving both countries, both American and Canadian forces' demands will exert pressure on existing North American capacity. Given that what was discussed in the 1988 Auditor General report became a reality in 2006 with General Dynamics purchasing SNC-TEC and achieving the status of a nearly dominant munitions supplier in North American markets despite its divestiture from American Ordnance.

Two fundamental questions arise. First, what is the cost of this choice or, in other words, what exactly is the premium paid for having such a security of supply? Second, are there alternatives to Canada's MSP?

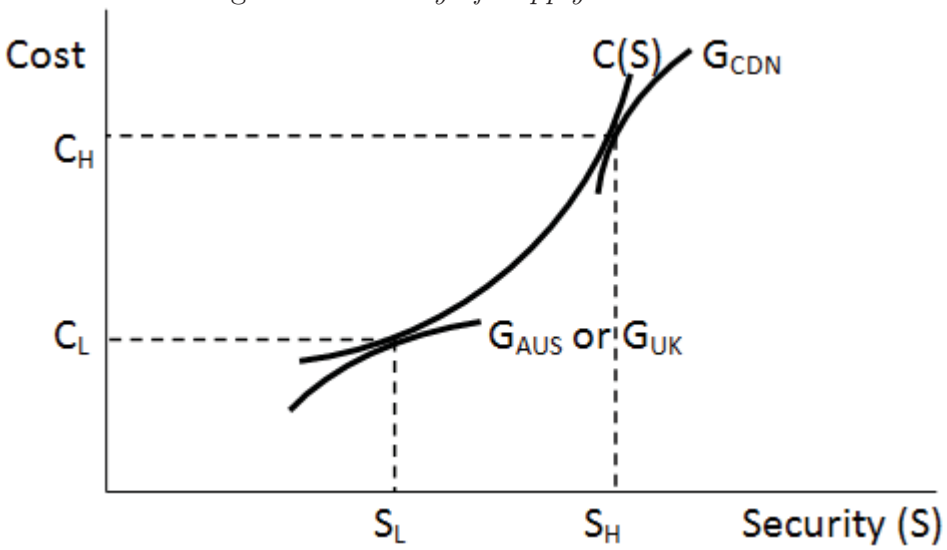
Underlying answers to these two questions involve the acceptance of a strongly risk-averse concept of security of supply embedded in the concept of the program. The three dimensions of the MSP described above generate a robust framework assuring the security in question, notwithstanding the 2007 Chief of Review Services criticism on surge capacity. Australia and the United Kingdom, examined in Section 5, have recently made transitions towards less

[55]Nearly identical statements exist in SSCs with IMT and Magellan but not with Colt Canada as its parent company Colt is an American corporation.

[56]MSP outputs are heterogeneous in terms of inputs, some nearly completely sourced domestically while others using mostly imported inputs.

risk-averse munitions programs, perhaps responding to the type of criticisms levied within the 2007 Chief of Review Services Report. Figure 1[57] illustrates the different approaches to the risk-cost tradeoff.

Figure 1: *Security of Supply Versus Cost*



The cost of assuring munitions provision increases at an increasing rate with security demanded.[58] Since there are two components to munitions provision required, namely the regular training requirements and the unpredictable peak-load demand due to conflict, the capacity to be sustained must include surge capacity. According to SSAs, the surge capacity is a doubling of the base production rate within a six-month period.

[57] 'G' denotes the level curve illustrating a country's perceived security-cost tradeoff. A steeper curve means that the country is prepared to pay more than others for a same increment of security.

[58] Munitions supply security is a very similar concept to emergency department capacity at a hospital differing only in the likelihood of need. The peak-load demand of an emergency department is more predictable not only because there are significantly more observations to build the capacity, including the possibility of using the nearby hospitals, but also due to the fact that the services needed are exogenous to hospitals whereas the need for peak-load munitions demand is endogenous in the sense that the supplies required depend on government decisions.

4.2.1 Retainers and Peak-Load Premia

The former demand requires a regular capacity, normally at such a small scale that it exhibits scale economies, and hence requires an extra layer of cost that can be considered a *retainer* because suppliers might choose to produce elsewhere, exploiting scale economies rather than producing domestically. Moreover, there may be a second factor that increases the retainer further: if there is no comparative advantage to produce domestically, the host will have to pay the premium.

The latter, i.e. the surge capacity to be sustained, induces the *peak-load premium*. This extra layer of security of supply is costly because the training and exercise requirements for production are regularly purchased by the host country whereas the peak-load demand is a contingency. This peak-load demand corresponds more with peace support and counterinsurgency operations rather than international emergencies. This surge in output requires "industry, utilizing existing facilities and equipment, to accelerate the production, maintenance, and repair of selected items, and to expand logistic support services to meet contingencies short of a declared international emergency."[59] This surge capacity or at least the associated fixed costs must be substantially financed by government.

The peak-load premium is lower if the supplier is able to preserve the surge capacity permanently by exporting. This does of course require international competitiveness and supply contracts that can be cancelled upon host country's request for peak-load supplies. These exports finance only part of the supplier's variable costs because purchasers will be willing to pay less, fearing interruption upon host country's peak-load requirements. Yet, the premium will be higher if the supplier is unable to export. In this case, the supplier's

[59]This definition is common to all three SSAs, i.e. with GD, IMT and Magellan.

fixed costs as well as its input inventories must be financed by the host country. It must be noted that these inventories include not only the physical inputs but also some on-call labour.

Now that the convex cost function $C(S)$ in Figure 1 has been explained, different countries' choices can be traced to their willingness to trade cost for security of supply. Australia and the United Kingdom (the two countries covered in this report) have, using different methods, have traded off some security for cost savings. Whereas Canada has been willing to accept high costs for high security of supply, at (S_H, C_H) due to its high tolerance of cost as given by its high marginal willingness to pay contour G_{CDN}, Australia and the United Kingdom preferred lower security of supply for lower costs at (S_L, C_{HL}) as implied by their low marginal willingness to pay contour G_{AUS} or G_{UK}. The 2007 Chief of Review Services Report criticized Canada's high risk aversion and interpreted it as incompatible with the era of asymmetric threats. In fact, if one goes back to the original objective of the MSP in 1978, the program was supposed to provide the CAF with "an assured wartime production capability for critical ammunition items." This was to be subject to a level of price performance that would provide an acceptable compromise between the higher cost of procurement in Canada versus the objectives of security of supply and industrial benefits. This has precluded the DND from developing plans for achieving the strategic objective of the MSP and from determining how best to apply direct and indirect funding mechanisms to achieve that objective.[60]

Briefly,[61] whereas Australia chose to auction off munitions production contracts while

[60] Office of the Auditor General of Canada (1988).

[61] More detail on these countries is offered in Section 5.

preserving about 20% of domestic production, the United Kingdom chose to delegate prime contractorship to BAE Systems which, in turn, contracted with various suppliers to assure munitions supply while preserving a large percentage of domestic production.[62] The large difference in domestic production percentages between the two countries is explained by the fact that the United Kingdom's domestic production is also internationally competitive whereas Australia has dispensed with offsets and no longer sustains inefficient industries unless they are critical to the operational effectiveness of the Australian Defence Force. What is common to both countries is a willingness to find competitive solutions to their munitions provision programs, having explicitly recognized the security for cost tradeoff $C(S)$.

4.2.2 Contractual Relationships

The MSP is governed by two sets of contracts. The first are the Strategic Source Agreements (SSAs)[63] that are nearly identical across the three ammunitions contractors (GD, IMT and Magellan), drawing the framework of the relationship[64] and establishing the franchise period, i.e. the long-term renewable commitment. The "long term" corresponds to five years except in the case of Colt Canada where the franchise is renewable every year but requires two years' advance notice for the termination of franchise rights. The second set of contracts, the Strategic Source Contracts (SSCs), are regulatory contracts that set the yearly fixed prices and establish the benchmark quantities for the year. Normally, such regulatory contracts

[62]Specifically, 80% of small arms ammunition and mortar shells, tank and artillery rounds are produced domestically.

[63]These SSAs are the so-called umbrella agreements.

[64]For example, the SSA with General Dynamics (GD) explicitly mentions seven other contracts under this umbrella and governing various aspects of the relationship.

codify price formulas, quantities and delivery schedules.

Consistent with contract governance theory,[65] the MSP established the "Ammunition and Rocket Production Steering Committee" and the "Ammunition and Rocket Production Working Group", chaired by the DND or PWGSC. These committees include contractor representatives and aim to address matters arising from MSP work foreseen beyond agreements and contracts.

The SSAs for ammunitions, i.e. those with GD-OTS, IMT and Magellan, run for five year periods, while Colt Canada's is two years in length. It is generally held that "contract duration is positively and significantly related to the franchisee's physical and human capital investments (which are often firm-specific)".[66] Also, consistent with MSP experience since its establishment, there exists strong evidence of learning in franchise contracting in terms of optimal length. In the case of the MSP, since there are no reports of disagreements over SSA durations of five years, we interpret the five year period as efficient. However, there is reason to suspect that, since "beauty contests"[67] are used in awarding franchise contracts under MSP, the high likelihood of contract renewal may be trumping the uncertainty of renewal to the franchisee. We note that neither 1988 Auditor General nor the 2007 Chief of Review Services reports refer to serious franchise frictions or hostile takeovers of MSP contractors since the inception of MSP.

As beauty contest criteria, the recurring themes of domestic production and surge capacity in the SSAs are fundamental to the MSP. Whether these criteria are indispensable today is debatable, especially in light of the Australian and British munitions programs .

[65] Tadelis and Williamson (2012).

[66] Brickley et al. (2006), Tadelis and Williamson (2012).

[67] In franchise contracting, the term beauty contest is reserved for the award of contracts by negotiation on the basis of predetermined criteria to distinguish it from pure negotiations.

The ammunitions contracts define the surge capacity as follows:

> "Surge" means the capability of industry, utilizing existing facilities and equipment, to accelerate the production, maintenance, and repair of selected items, and to expand logistic support services to meet contingencies short of a declared international emergency.[68]

Since the contractually-specified six month advance notice required for a surge is not sufficient for the contractor to build further capacity, one major implication of surge requirement is that the contractor must carry *excess capacity*.

Excess capacity requires extra plant and equipment capacity as well as stand-by or on-call human resources as well as inventories of other inputs, all of which are costly. This is the peak-load premium defined in the previous section. This peak-load premium is negotiable as well as subject to some risk versus cost savings tradeoffs if the excess capacity can be used for market supply. A similar decision problem arose for the United Kingdom[69] in the case of their tanker-cum-transport services program[70] whose excess capacity could be used to supply the market by the contractor AirTanker.

The peak-load premium thus depends on three factors. (1) Of course, the expected surge volume of munitions which would, solving backward, determine the required surge capacity. The latter would require fixed inputs like plants and equipment but also retainer fees for on-call personnel as well as contingent input contracts. (2) The contractor's export capability[71] which depends on their comparative advantage in part determined by their total volume of

[68]Excerpt from Section 1.16 of the General Dynamics - Ordnance and Tactical Systems SSA.
[69]National Audit Office (2010).
[70]Curiously, the United Kingdom subsidized the runner-up's bidding costs in order to sustain competition in franchise bidding.
[71]Alongside non-CAF domestic sales which seem to be substantial according to KPMG (2012a).

production or, in other words, on how far down it is along its average cost curve. We have to note that MSP contractors produce licenced products and as such their export potential depends on factors other than technological advantage. (3) Importantly, the supply contracts it is offering to the market because, given the surge requirement, the contractor can only offer contingent contracts due to its costly excess capacity.

Given that SSAs, which delineate the MSP's core requirements, are long-term contracts which seem to have settled at five years in length, the next relevant questions revolve around SSCs (the yearly regulatory contracts). Since SSCs were not made available for analysis within this report, the next two sections will serve as a transition towards two major aspects of MSP, the common costs and the export potential, while examining the relationships between SSAs and SSCs.[72]

4.2.3 Regulatory Contracts Over Franchise Duration

Monopoly franchises consist of "competition for the market" rather than "competition in the market" [73] and may provide an alternative to regulation if franchise duration is relatively short. Yet, in industries with significant sunk investments or durable assets whose lives exceed the franchise duration, the mismatch will impose a transfer of assets from the incumbent to the entrant should an outsider win the franchise, whether under franchise bidding, negotiations or beauty contests. But, for franchise auctions, such asset evaluations are akin to regulation. Thus, short duration franchises come close to regulation.[74] In the case of the

[72]We note that the National Shipbuilding Procurement Strategy (NSPS) of 2010 uses the same governance structure with umbrella agreements and, yet to come, shorter-term contracts for batches of navy vessels. Similar issues arise such as the similarity between shipyards and munitions plants as fixed capacity.

[73]H. Demsetz (1968).

[74]J. Church and Ware, R. (2000).

MSP, the five-year franchise duration is and had to be supplemented by annual regulatory contracts as part of the implementation of program objectives.

Regulation, in this context, refers to two separate phenomena. First, the MSP determines the structure of the industry through SSAs. Not only is the number of firms fixed but their interrelationships are constrained by assigning mutually exclusive ranges of products to them, which annuls any potential for competition. Moreover, they are constrained to purchase their inputs from each other if indeed an MSP contractor produces that particular input. Finally, their excess capacity to support potential surges is somewhat loosely imposed by SSAs. Second, using the regulatory "SSC"[75] contracts, MSP contractors are behaviourally constrained by such instruments as yearly prices, regular training and exercise quantities, the logistics of provision and of course quality.

There have recently been some changes to SSCs. From 1996, the government started bundling various ammunitions into single SSCs. While allowing a precise calculation of total annual costs, bundling could blur individual item costs and allow the contractor to more easily shift common costs.[76] Beginning in 2003, SSCs became annually negotiated fixed price contracts rather than ceiling prices that had been used under MSP and often used in utility regulation. The basic risk-incentive tradeoff is illustrated in Figure 2.

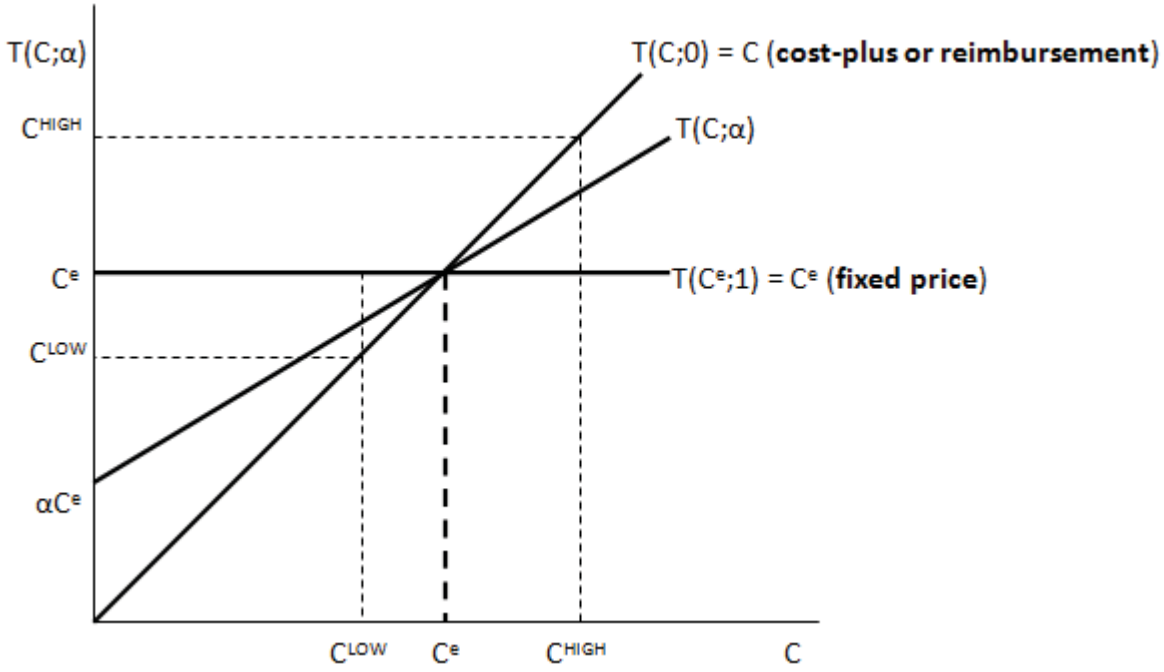
The figure illustrates the cost-plus $T(C;0)$, fixed-price $T(C;1) = C^e$ and incentive $T(C;\alpha)$[77] contracts where the general formula is $T(C;\alpha) = \alpha C^e + (1-\alpha)C$ with $0 < \alpha < 1$, where C^e is typically the expected or negotiated price or cost and C is the actual or realized

[75]SSCs are the more standard regulatory contracts because they impose price, quantity and quality.

[76]More detail on common costs is offerred in Section 4.3.

[77]Under the incentive contract cost overruns and extra normal profits are shared between the contractor and government. This had been the case under MSP until 2003. We note that this sharing requires end-of-year audits. In a related practice, the government and SNC shared profits from international sales.

Figure 2: *Risk-Incentive Tradeoff in Procurement Contracting*



cost with the cost always including a normal profit. The incentive contract $T(C;\alpha)$ entails profit or loss sharing, with the sharing parameter α, such that:

$$T(C;\alpha) = \alpha Ce + (1-\alpha)C = C–\alpha(C–C^e)$$

where $C - C^e$ is the cost overrun. If a cost overrun exists, a fraction α of the overrun is the contractor's responsibility.

The fixed-price contract, while providing a strong incentive to reduce cost, shifts the risk entirely to the contractor. This can be seen by observing that for a cost overrun C^{HIGH}, the contractor would lose:

$$\pi = C^{HIGH} - T(C^e;1) = C^{HIGH} - C^e < 0$$

whereas for a certain low cost realization C^{LOW}, the contractor would keep the extra normal profit:

$$\pi = T(C^e;1) - C^{LOW} = C^e - C^{LOW} > 0.$$

These potential swings in profits, moderated by the fact that SSCs last only a year, still inject risk into the franchise relationship, and this risk is seemingly borne entirely by the contractor. However, as a full ex-post audit might reveal, some risk-sharing may be taking place through a higher negotiated annual price, in particular since the price is that of the unique MSP bundle assigned to the particular contractor. Moreover, the use of a bundle price is in itself advantageous to the contractor that can, by bundling different items, average out swings in the costs of various items.

Beyond contractual risks, the firm now bears the foreign exchange risk fixed-price contract. The negotiated price C^e would have to try to anticipate the foreign exchange risk and changes in input prices. Finally, the regulatory lag is just a year. Since prices are renegotiated yearly, the MSP contractors, though they have a strong incentive to reduce costs and beat the franchise price, the lag is just isn't long enough. This undermines the incentive to innovate, reduce costs and lower prices, which would enable the contractor compete in global markets.

4.3 Common Costs

All MSP contractors are multi-product franchise monopolists. Since the yearly regulatory contracts bundle the products one might be tempted to entertain the idea that the attribution of common costs to different products may not matter after all. Given that MSP structure precludes competition between contractors, this may indeed be true. However, if any domestic or further international competition, i.e. the promotion of exports, is contem-

plated, the regulator[78] will be forced to closely examine the attribution of common costs to particular products.

This section will briefly introduce and categorize common costs before proceeding to an analysis of common cost issues arising in the MSP. Common costs are not attributable to any one department or product of a multi-product firm; moreover, they can be part of variable or fixed costs. In production processes with common inputs resulting in common costs, costs may begin to become attributable at certain stages of production upon a *split-off* juncture.

A typical munitions production process consists of three processes: melt-pour load, assemble, and pack (LAP). The first of these three processes includes a split-off juncture where the molten metal, once poured, yields split-off paths for particular munitions. The assembly process may also have originated in the production or acquisition of propellants and explosives and hence exhibits a joint process, thus leading to joint costs.

Joint Costs

A joint cost is a subset of common costs that arises when two or more products pass through the same production process up to a split-off juncture after which costs become *traceable* to products. For example, drilling for oil or gas and discovering deposits of both generates joint costs, up until the discovery is made. Second-growth forest trees yielding different lumber products or herding dairy cows yielding skim milk and cream fall into the same category. These shared costs include the basic production of multiple goods and fuel costs. Since some common costs vary with production, they constitute common variable

[78]Given that PWGSC is the contracting agency of the government, it acts as the regulator as well. Since the MSP is a government program, the fact that each of the MSP contractors is a monopolist seller to the government doesn't fall under the mandate of the Competition Bureau.

costs. Joint costs do not come about as frequently as common costs which tend to arise in all lines of production. For instance, common money costs such as depreciation and corporate or other taxes are also examples of this.

Traceable and Common Fixed Costs

Traceable costs exist only as a result of the presence of a particular segment within a firm. For instance, if a firm did not have an R&D division, it would not have to pay a salary to the manager of said R&D division. Therefore, the manager's salary as a fixed cost is specifically traceable to the R&D division but not attributable to different outputs produced by the R&D division.

Common fixed costs are costs that are not traceable to a specific segment within the firm. These are costs that fund people, resources or activities that support more than one segment within the firm. For example, the CEO's salary would be a common fixed cost, as their salary is not traceable to any specific segment within the company.

4.3.1 Common Costs and Profits in Multi-Product Industries and the MSP

SSAs are clear in that the MSP framework establishes strategic sole sourcing by assigning bundles of munitions to the MSP contractors. Whereas the government's aim ought to be to grant them normal profits, sole sourcing enables contractors realize extra normal profits. They can do so in a variety of ways.

First, the contracting agency has to include a "normal" profit component into the negotiated price otherwise there would be no incentive for firms to serve the government market. This profit is supposed to capture the true economic costs of production that cannot be

captured by accounting costs such as the costs of working capital, facilities capital, and the costs associated with risk. The contractor could raise its profit over and above the normal profit by exaggerating these latter costs through negotiations.[79]

Second, the use of fixed-price contracts always generates a regulatory lag: if the regulator observes costs that are lower than the fixed price, the extra normal profit can only be expropriated in the next round of fixed price negotiations. The more frequent the negotiations, the more successful the regulator will be in constraining extra normal profits.[80] However, a deleterious tradeoff arises if the regulator's longer term objective is to stimulate innovation and exports. The extra normal profit may serve as a strong incentive for the contractor to reduce costs by innovation and hence become more competitive in global markets. This incentive thus serves to balance the government's short term objective to lower the cost of acquisition against the longer term objective of the establishment of an industry as part of the global supply chain. In this regard, the three and a half decade existence of the MSP cannot be said to present an illustrious example of export champions.[81]

Third, and perhaps most importantly as far as the MSP is concerned, even if bundle prices are set equal to true economic costs, contractors can still earn extra normal profits by shifting common costs between products. Even if the current fixed price contracts covered single products, the contractor's common cost attribution advantage would have enabled it to earn extra normal profits. What the bundle price does is it deprives the regulator of exogenous yardsticks for individual products, i.e. prices for the same products on global markets. This is especially true under the NATO standardization initiative where allies are

[79] As the SSCs were not analyzed in this study, this statement is hypothetical in nature.
[80] Rogerson (1994).
[81] KPMG (2012a).

slowly standardizing ammunitions, hence enabling comparisons with ally nations.

MSP contractors typically produce multiple products within the same plant. They sell to Canadian and foreign buyers,[82] thus combining commercial or competitive defense and security business with the sole sourcing contracts with PWGSC. Joint production[83] at certain stages makes it difficult to sort out which costs are associated with each particular product. Thus, contractors may shift significantly large fractions of their costs into "overhead pools"[84] and reallocate them to individual products using various formulas.

> "By shifting one dollar of overhead away from a competitively priced defense program or a purely commercial product selling at a competitively determined price and onto a sole source defense product where price is set equal to accounting cost, a defense firm could raise its profit by one dollar."[85]

Although the contractor cannot change the price in competitive markets, it can reduce its cost by a dollar by shifting the overhead to sole-sourced product, be paid in full and hence make a dollar in profits. Contractors can succeed to shift overhead in two ways. First, regulations governing cost allocation may give contractors some leeway to switch allocation rules or to change those rules. Second, much of common cost is allocated in proportion to labour used in production. Thus, contractors may achieve a desired common cost by distorting relative input proportions used across products in order to increase labour usage by labour padding.[86]

[82] KPMG (2012a).
[83] Particularly in the melt-pour load process but also in producing or acquiring propellants and explosives.
[84] Overhead pools at one point reached 58% of in-plant costs for four major aerospace contractors Rogerson (1994).
[85] Rogerson (1994).
[86] Rogerson (1994).

4.3.2 The Relevance of Common Cost Attributions

There are three consequences arising from the difficulty of regulating the attribution of common costs to individual products. First, relative prices of individual munitions can be distorted relative to market prices. However, for a purchaser like the government, it is really about the total cost or the bundle price that matters. So this distortion may be inconsequential. Second, the negotiated fixed price may exceed the market price augmented by the premia paid for domestic production capacity, including the lack of scale economies, and the peak-load priority. Third, as long as the common cost attribution is blurred, the regulator cannot use policy tools efficiently to steer the contractor towards exposure to global markets in order to achieve export objectives in individual products knowing that the contractor may not have comparative advantage in all products.

4.4 Innovation and Promotion of Exports

At the inception of the MSP, it was expected that MSP contractors would, in the long run, achieve economies of scale and lower costs to internationally competitive levels plus, of course, the premium due to domestic production and peak load contingency. The 1988 Auditor General report estimated that "Canadian-produced ammunition costs 30 percent more than the lowest prices available from other NATO suppliers". This was confirmed in 2014 by Nammo.[87] Moreover, the industry would hopefully generate exports and spillover effects. The most recent review of the program by Chief of Review Services in 2007[88] is conclusively pessimistic about the outcomes in that neither of these objectives were achieved.

[87] In an interview, Nammo Canada representative quoted a 35% premium.

[88] The 2008 ADM(Materiel) Munitions Supply Programme Options Analysis report was not made available to the authors of this study.

Given the limited domestic demand from the CAF and other security agencies, it was hoped that scale economies would be achieved by exports. In fact, impressively enough, exports were achieved to many countries over time: U.S., Australia, Belgium, Denmark, France, Greece, Holland, Italy, Jordan, Kuwait, New Zealand, Oman, Singapore, Sweden, Thailand, the Philippines, the United Kingdom and the United Arab Emirates.[89] However, those proved sporadic and the majority of current sales remain domestic.[90] Nearly 60% of the total output is sold domestically, amounting to $942.5M. By comparison, this is less than modest if one compares it to Nammo, a Norwegian munitions supplier that was established in 1998 and grew internationally to export 70% of its output outside of Scandinavia.[91]

Moreover, at the time of GD's purchase of SNC Technologies, the US Federal Trade Commission challenged the takeover on grounds that it would lessen competition[92] in this market, and, as a consequence, GD had to divest its 50% interest in American Ordnance that was the second largest munitions supplier in the US. Therefore, it seems safe to estimate that a significant portion of GD-OTS exports may be reimported into US as an intra-GD transaction.[93] The composition of GD-OTS output must hence be scrutinized in order to understand the export potential of the MSP.

Finally, since joining the global supply chain depends on comparative advantage and a large majority of MSP contractors' products are licenced, it is difficult to assert that MSP contractors are oriented towards exporting.

The above observations reinforce the conclusion of the 2007 Chief of Review Services

[89]Release (2006).
[90]KPMG (2012a).
[91]Release (2011).
[92]Just to place the challenge into perspective, GD employed upwards of 80,000 in the US whereas SNC Lavalin a mere 1,600 at the time it was acquired.
[93]Commission (2006).

Report that the export goal and, hence, the achievement of scale economies have not been realized. The main difficulty in orienting MSP contractors towards export goals is the import-substitution architecture of the MSP which, in fact, assigns the conflicting goals of domestic production of the relevant CAF ammunition demands and the industry's export orientation. Protection from foreign suppliers, motivated by security of supply concerns and insulation from domestic competition due to small domestic demand, do not exactly constitute a recipe for exports as they remove all competitive pressure on innovation.

In the light of a new European policy initiative,[94] the two goals of domestic production and successful exports can only become compatible at the cost of restructuring the industry by allowing competition, either *in* the market or *for* the market. The key to establishing effective competition, at least partially, is to induce more than one MSP contractor to produce the same ammunition. This goal can be achieved in two sequential steps: first, the implementation requires overlapping bundles for contractors so that they compete; second, this head-on competition can occur *in the market* by purchasing from both depending on terms they would offer or, alternatively, *for the market* by auctioning franchises in particular products. Any such domestic competition would apply downward pressure on costs and towards innovations. The cost of inducing competition[95] of either variety may be thought off as investment in comparative advantage or for exports. This is vertical or "quality" competition rather than horizontal competition, the first being a prelude to exporting ability. After all, where there are no national champions like Bombardier that are subject to global competition, only domestic competition can be a precursor to capturing global markets.

[94] Aghion et al. (2012), Harrison and Rodriguez-Claire (2009).

[95] Subsidies to the sector rather than to particular contractors, R&D investments, and marketing mechanisms towards global chains.

5 Munitions Supply: Approaches of Selected Nations

This section examines the approaches to munitions supply management employed by two selected nations: Australia and the United Kingdom. An overview of the countries' respective munitions industrial bases are provided as a means to establish proper context to the analysis. The unique challenges faced by each country in terms of economic and geopolitical considerations and the policies employed in order to deal with these issues are also discussed. Comparisons to the current Canadian munitions supply program and possible insights are then offered.

5.1 Australia

Australia's approach to munitions procurement policy is, as with its overarching defence industrial base policy, significantly affected by geopolitical factors. As a largely isolated island continent, with even the nearest allies being thousands of kilometers away, many of the possibilities for management of their defence industrial base that would otherwise be available are ineffective from a cost perspective and have the potential to be operationally compromising. From the perspective of munitions, these issues have historically given rise to a desire to produce key munitions items domestically so as to ensure security of supply and decrease operational liabilities.

Munitions manufacturing in Australia is primarily handled through two major facilities, one each in Mulwala, New South Wales and Benalla, Victoria. The Mulwala facility produces explosives and propellants and is composed of two plants, one for the manufacture of propellants and the other for the manufacture a range of high explosives for the Australian

Defence Force.[96] The output of these plants is either passed on to the Benalla facility for use as input into munitions products or sold off commercially. The Benalla facility, meanwhile, produces a variety of finished non-guided munitions items, with some product being destined for export.[97]

5.1.1 The 'SAMS' and 'MA' Agreements

The Australian munitions industry is currently approaching a point of major transition. The existing munitions production agreements are the Strategic Agreement for Munitions Supply (SAMS), which covers production from the facility in Benalla and operates under a "Build-Own-Operate-Transfer" contractual framework, and production from the facility in Mulwala is handled under the Mulwala Agreement (MA), which is handled as a "Government-Owned, Contractor-Operated" contract. In each case, Thales Australia is the primary industry partner. These agreements are each set to expire in 2015, and there is great desire on the part of the Australian government, and in particular in the Defence Materiel Organization (DMO), to develop an entirely new contracting framework that addresses many of the inefficiencies present in the current arrangements.[98] [99]

An inherent problem with the current contracting framework is the need for large money transfers to maintain the capability for production of key munitions items on an annual basis.

A recent Australian National Audit Office report[100] examined the issue of these capability

[96] KPMG (2012b).
[97] KPMG (2012b).
[98] Bergmann (2012).
[99] Defence Materiel Organisation (2014).
[100] Australian National Audit Office (2010).

transfers. The SAMS contract covers the provision of 13 munitions items out of an explosive ordnance inventory of over 830, with purchases totaling in excess of 30 million AUD per year. Meanwhile, the Department of Defence must make an additional capability payment of 63.2 million AUD.[101] The Mulwala Agreement has a similar component, with 29.7 million AUD in capability payments.

These two existing agreements involve only a small portion of the total munitions requirements of the Australian Forces. In total, this indigenous production only accounts for about 22 percent of annual munitions needs.[102] With capability payments being in excess of twice as much as the actual munitions items purchased, a huge premium is clearly being paid for the sake of domestic production. This problem is further exacerbated by the fact that the Department of Defence views the items produced at these domestic facilities as being "increasingly irrelevant",[103] and so the justification for producing these items is becoming weaker as time passes.

5.1.2 The 'DMMA' Project

The Domestic Munitions Manufacturing Arrangements project is slated to replace the existing SAMS and Mulwala contracts. In a sense, the DMMA project reflects the opinion of the Defence Materiel Organisation that the SAMS and MA contracts were greatly inefficient and did not provide enough benefit for the costs incurred on an ongoing basis. It is therefore unsurprising that one of the main goals of this new arrangement is to do away with transfer payments for capabilities and move towards greater integration into the global

[101] These figures are indexed anually, and are shown here in 2009 dollars.
[102] Bergmann (2012).
[103] Australian National Audit Office (2010).

munitions supply chain. This integration is hoped to lead to more opportunities for export of munitions items and the achievement of greater cost effectiveness of production activities.

The DMMA calls for the Department of Defence to take control of the Benalla facility, effectively ending the Build-Own-Operate-Transfer framework of the SAMS contract. The government would then own both munitions production facilities, and a third party industry partner would be contracted for the management of production operations.[104]

An important aspect of the DMMA project involves the issue of rents. As proprietor, the government would not charge the industry partner for use of the manufacturing facilities, as a focus on global competitiveness is one of the primary goals of the DMMA project and added fixed costs would not likely be conducive to such ends. This, in theory, should also result in increased savings in procurement for munitions produced by the two facilities.[105]

With regards to the selection of an industry partner, the Department of Defence issued invitations to enter the bidding process to six firms, including the incumbent, Thales Australia, in order to ensure a transparent and competitive bidding process. As this has progressed, several firms have joined with existing candidates in order to put forth a stronger bid, while others have dropped out of the process entirely. As of August 2013, three competing bids remained in the process, each of which consisted of two or more firms: Alliant Techsystems Inc (ATK) with NIOA Nominees Pty Ltd, American Ordnance LLC, and Day & Zimmerman Inc; BAE Systems Australia Limited teaming with Expal Systems SA; and Thales Australia Pty Ltd teaming with General Dynamics-OTS, NAMMO and Winchester Australia.[106]

[104]It can therefore be said that the DMO sees the path to integration to global supply chains in 'government-owned, contractor-operated' (GOCO) arrangements.

[105]This follows from conventional economic theory stating that fixed costs would be recaptured in the price of the product sold.

[106]Defence Materiel Organisation (2013a).

The criteria for participation in the process and evaluation of the subsequent bids are varied. Given the desire to achieve cost effectiveness and efficiency in production operations, a significant emphasis on expertise and munitions industry experience is evident, with requirements of having an existing munitions production line and a credible ability to satisfy Australian Defence Force requirements in the present and future. However, there are also other criteria that deal with safety standards and environmental factors.[107] [108]

5.1.3 Comparisons to Canada's Munitions Policy

A mention of a few key differences between the Australian and Canadian munitions industrial bases is necessary before the consideration of policy aspects. The Canadian Munitions Supply Program traces its beginnings to the late 1970s, with a first round of privatizations following soon thereafter; in contrast, the Australians have only begun privatizations relatively recently, with the announcement of the privatization of the key munitions partner Australian Defence Industries occurring in early 1997.[109] A clearly-defined munitions industrial base policy prior to this time was essentially lacking. Moreover, the composition of Australia's munitions industrial base has not been as stable over the past few decades as has been the case in Canada. In the early 1980s, Australia had no fewer than seven major munitions production facilities.[110] By 2006, Australia had only two major plants producing munitions for the ADF, with several plants being closed, repurposed, or amalgamated with other facilities.[111] Given these factors, coupled with the upcoming transition to the Domestic

[107] Bergmann (2012).
[108] Defence Materiel Organisation (2013b).
[109] Cotterill (2008).
[110] Cameron (1985).
[111] These two plants being the aforementioned Benalla and Mulwala facilities. The Benalla plant is a new construction, circa 2000, and was therefore not one of the original seven in operation in the 1980s.

Munitions Manufacturing Arrangement contracting framework slated to begin in 2015, it is fair to qualify the Australian munitions industrial base as being in a state of transition.

There are, however, several aspects of Australian munitions policy that are relevant to the discussion of Canada's Munitions Supply Program.

The Australian Department of Defence and Defence Materiel Organization have clearly adopted an approach to munitions management that places an emphasis on maintaining a domestic capability in manufacturing. As in the case of the Strategic Agreement for Munitions Supply and the Mulwala Agreement, large cash transfers were offered on an ongoing basis solely as a means to maintain these capabilities. This practice bears some similarity to the MSP goal of maintaining the viability of domestic production, where profits of participating firms have historically been protected from market pressures to a significant extent;[112] it bears mentioning however that the premium paid for this is likely not nearly as high as it has been in the Australian case.[113] However, the use of a competitive auction for firm participation in the 2015 DMMA project is likely to drive such a premium down.

Further, both the Canadian and Australian munitions authorities use similar language in identifying the domestic production of "high-volume, key munitions items" as being an important policy goal. In each case, these policies are justified as being a necessary means to hedge against possible supply interruptions in times of conflict, in addition to providing both industrial benefits and opportunities for research and development.

The argument from a security of supply standpoint, however, is perhaps more relevant in the Australian context given obvious geopolitical considerations. As Canada is adjacent

[112]This follows from the discussion in Section 2.

[113]As mentioned earlier in this section, transfers to firms for the purpose of maintaining munitions production capabilities have been reported as high as twice as much as the actual cost of the munitions items procured.

to the United States, any potential interruption in munitions supply is not likely to be as severe as it would perhaps be in the case of Australia. This fact may explain why the Australian Department of Defence has been willing to swallow the aforementioned large capability transfers, judging the threat of interruption of supply to be significant enough to make the premium worthwhile.

However, the forthcoming DMMA project clearly indicates a preference for a "global market" based approach to munitions supply, with bids from multinational firms being at least partly evaluated on their ability to incorporate Australian munitions production into the global supply chain. This is indicative of an approach similar to that of Canada and other countries, involving the promotion of exports as a method of lowering costs in government procurement deals and ensuring an adequate level of competitiveness between domestic firms and offshore manufacturers.

5.2 The United Kingdom

The United Kingdom's policy with respect to munitions procurement can be described as one that is focused on maintaining capabilities and competitiveness in domestic operations while finding innovative ways to deal with potential threats in terms of security of supply for those munitions products that are procured offshore. This follows from the Defence Industrial Policy White Paper published in 2005, which brought forth a number of recommendations to reinvigorate dated munitions policy, and continued with the implementation of the Munitions Acquisition Supply Solution (MASS) in 2008.

These policies follow a long term evolution in the United Kingdom's munitions industrial

base, which once consisted of a relatively large number of government-owned, government-operated plants in the post-war era, and has since given way to a relatively small number of privately-run facilities.

The privatization of government-owned facilities occurred in 1987, with BAE Systems becoming the MoD's primary industry partner. At this time, the munitions industrial base resembled that of Canada's prior to privatization, with most facilities making use of World War II-era manufacturing equipment. Employment in munitions production then totalled approximately 19,000 workers across 13 different facilities.[114] Extensive modernization initiatives, including the closure of dated plants and increased automation in the production processes, had led to a great decrease in the number of facilities and total workers employed.[115] As of 2008, upon the adoption of the MASS, only three plants remained, employing roughly 1,700 workers. These three remaining facilities[116] however, have been the target of continued investments on the part of BAE Systems, with purchases of new machinery such as forges and robotic machining cells. Together, these three plants have reportedly filled up to 80 percent of the United Kingdom military's needs for small arms ammunition as well as mortar shells and tank and artillery rounds, leaving only 20 percent of procurement volume to be sourced offshore.[117]

[114]King et al. (2010).
[115]King et al. (2010), BBC News (2012).
[116]Located in Birtley, Tyne and Wear; Glascoed, Monmouthshire, South Wales; and Radway Green, Cheshire. In 2012 a new facility was opened in Washington, Tyne and Wear. Defence Industry Daily (2008).
[117]Defence Industry Daily (2008).

5.2.1 White Paper Policies

The 2005 White Paper reveals a novel approach to the management of the munitions industrial base, blending an emphasis on the maintenance of domestic productive capacity and other innovative measures as a means to ensure security of supply.

Maintaining domestic capabilities, in the context of the United Kingdom, goes beyond making payments to industry partners as a means to subsidize production or ensure continued operations. The desire is also centered on maintaining a capability for research and development of munitions, with an eye towards developing more accurate munitions, while decreasing the need for stockpiling. Further, maintaining domestic R&D abilities provides the MoD a greater capacity to assess the suitability of munitions products offered by offshore firms, a policy referred to as a 'smart buyer capability'.[118]

The White Paper also identifies the types of munitions products that domestic firms have a comparative advantage in production when compared to that of other countries, and specifies products that can be obtained offshore with limited effects on operational liabilities. Specifically, the MoD considers production of insensitive munitions and energetic materials as being capabilities that are competitive internationally and essential for security of supply. Conversely, not all aspects of bulk explosives manufacture are necessarily needed to be produced domestically so long as security of supply could be guaranteed.[119]

Another important feature of the United Kingdom's munitions policy that is elucidated within the White Paper involves the reduction of munitions stockpiling while making use of "manufacture surges" as a means of risk management in security of supply. This concept

[118]U.K. White Paper (2005).
[119]U.K. White Paper (2005).

does not apply solely to BAE's domestic operations; offshore manufacturers are expected to be able to "provide a significant number of stores at 24 hours notice" in order to meet these surge requirements.[120] Note that this definition of "surges" is markedly different from that which is present in Canada's contracting framework, which, as discussed in Section 4, asks only for a doubling of manufacture capacity over a 6 month period.

5.2.2 The Munitions Acquisition Supply Solution

Signed by BAE Systems Land Systems Munitions and the MOD's Defence Equipment & Support organization, MASS has a duration of 15 years and is aimed at continuing to provide 80 percent of munitions to the military. The partnership largely continues in the same vein as the policies outlined in the 2005 White Paper, striking a compromise between domestic industrial competitiveness, cost effectiveness and security of supply. The agreement covers a vast amount of munitions items, from all small arms munitions to mortar, tank, and artillery shells, as well as naval munitions.

There are three key components to the MASS. Firstly, the MoD agrees to pay a "capability charge" to cover fixed costs of the domestic facilities as a means to protect them against demand swings.[121] These charges have reportedly[122] amounted to 100 million pounds per year, and are contingent on BAE lowering production costs anually.[123] The second key component involves payment for munitions products; these are to be priced at "direct material and labour costs" in order to compensate for commodity swings.[124] Prices on munitions

[120] U.K. White Paper (2005).
[121] This is not unlike the capability transfers employed in Australia, though the relative costs are likely lower in this context given the scale of the United Kingdom's munitions production.
[122] Chuter (2012).
[123] Unfortunately, figures on total munitions buys are not available.
[124] The rising global price of steel is a significant liability in munitions production costs.

items are also to be guaranteed to the MoD to not exceed a given threshold over a 10 year period. Thirdly, the MASS adds a requirement for the availability of surge manufactures and additional engineering tasks as needed to support operational developments.[125]

The agreement also reportedly[126] has a focus on ensuring efficiency through partnership, working with a system of reward and penalty clauses for over and under-performance.[127] The partnership aspect is to be reinforced through the continuation of assistance in investments for modernization efforts in production facilities. A commitment of 120 million pounds to this end has been used to finance the creation of a new facility at Washington, Tyne and Wear, improvements in existing facilities at Radway Green and Birtley, and new production capabilities at the Glascoed munitions plant. Gains in efficiency and innovation are also contractually encouraged through opportunities for shared savings and increases in export sales.

5.2.3 Comparisons to Canada's Munitions Policy

Comparisons between the United Kingdom's munitions policy and that employed by Canada must be prefaced with the caveat that the economies of scale enjoyed by the United Kingdom due to greater domestic demand and a larger munitions production infrastructure likely lead to lower costs of domestic procurement than is possible in Canada or similar countries. For instance, while Australia manages to cover approximately 22 percent[128] of their munitions needs through domestic production, the United Kingdom is, as mentioned earlier in this section, able to cover 80 percent of all conventional munitions demands, leaving only the

[125]Defence Industry Daily (2008).
[126]Defence Industry Daily (2008).
[127]Deagel (2008).
[128]Bergmann (2012).

remaining 20 percent to be sourced offshore. These economies of scale also allow for more opportunities for munitions export: BAE Systems is a key bidder in the Australian DMMA project, and as of 2012 has been attempting to reach similar agreements with France and New Zealand.[129]

Two aspects of the MASS merit specific attention here.[130] The capability charge component of the MASS is peculiar as it mirrors the 'capability transfer' policy in use in Australia, and to an extent is comparable to the premiums paid in Canada for the maintenance of domestic production, though each is justified through differing arguments. In the end, these transfers represent a type of subsidy and in each case are meant to allow for greater domestic capabilities with a goal of creating export opportunities. It can be argued through conventional economic theory, however, that the international munitions market would be collectively better off if no country adopted these subsidies, and domestic taxpayers would benefit from having more tax dollars available to devote to competing areas of attention. Conversely, the current international reality is that if one country adopts subsidies for domestic munitions manufacture, other countries must follow suit or be at a disadvantage.[131] Taken together, smaller countries may not have a great deal of recourse other than to adopt subsidy practices similar to those in Canada and Australia. The remaining question, then, is how best to implement such practices so as to achieve an acceptable effect at the lowest possible cost to the taxpayer.

Secondly, the United Kingdom's approach to dealing with security of supply issues is an

[129]Chuter (2012).

[130]The third - the guarantee of prices and accounting for swings in material costs - is very similar to contracting arrangements already in use in Canada.

[131]If a country, such as the United States, had sufficiently high economies of scale, then they would not need to adopt subsidies in order to be competitive internationally.

innovative one - specifically, the use of relatively small munitions stockpiles coupled with the requirement of surge capabilities for both domestic and foreign munitions producers. Using stockpiles of munitions in order to deal with potential shortfalls in munitions imports is not a new idea, and can be effective in bridging short interruptions. However, stockpiles represent liabilities for a country, as each type of munition has a certain shelf life after which they must be serviced or discarded. The idea of reducing stockpiles is more conducive to supply management, as stocks are turned over in shorter timeframes, though smaller stockpiles means greater exposure to risk. The surge manufacture requirements are, as mentioned, markedly different from those which are outlined in MSP contracts, particularly since foreign munitions suppliers must also abide by them. It is difficult to determine whether this could be accomplished in the Canadian scenario, as it seems likely that foreign firms are willing to accept the United Kingdom government's requirements due to the sheer volume of munitions demanded; the Canadian demand for munitions may not be enough for it to be profitable for foreign munitions partners to accept this added cost. As far as the United Kingdom's approach is concerned, however, it remains to be seen whether this type of requirement would be effective in practice, as it may be difficult to replace large stockpiles on short notice, even if such a requirement is anticipated.

6 Policy Implications

The above analysis of the MSP brings about a clear conclusion: the program is outdated and a new direction is necessary.[132] The most progressive NATO allies, Australia and the United Kingdom, have recently reformed their munitions procurement practices in careful consideration of the post-Cold War realities. Perhaps most illuminating in this regard is the case of Australia and its strategically challenging geo-political environment: security of supply, it has been determined, does not require an iron-clad domestic productive capacity and surge capability in munitions. Rather, Australians moved forward with full franchise bidding. The practice of these two countries demonstrates the existence of multiple feasible directions. The United Kingdom, with their vast domestic and globally competitive capabilities, delegated their munitions program to BAE Systems as their prime contractor whereas Australia, with narrow domestic capabilities, chose to establish a full franchise bidding mechanism.

Potential directions for Canada's MSP, given the existing capabilities, reasonably excludes the British and Australian directions as there neither exists a Canadian counterpart to BAE Systems nor are the existing Canadian munitions domestic production capabilities as narrow as Australia's. However, common to British and Australian reforms is a transition from quantitative security of supply to a contractual security by relaxing the absolute requirement that the munitions be produced domestically.

A few remarks should set the stage for feasible reform directions for a new Canadian munitions procurement mechanism. First, given that most air and naval munitions are imports, the existing range of products produced under MSP can be narrowed down without under-

[132]This is in agreement with the 2007 Chief of Review Services Report on the MSP.

mining the operational capabilities of the CAF. If the CAF accepts the supply/availability risk with air force and navy munitions, some of the munitions included in SSAs may also be acquired outside the MSP. Since most anticipated operations are overseas, air force and navy munitions will impose a tighter operational constraint in terms of urgency. The munitions to be excluded from MSP could be those with the highest cost savings versus supply/availability urgency ratios. Moreover, a diversification of suppliers with contingent contracts would mitigate the risk arising from offshore procurement. Second, since there is absolutely no competition inherent in the MSP's exclusive bundles framework, and no possible competition to gain supplier status within the MSP, there is categorically no incentive for MSP contractors to become globally competitive. Third, related to the previous remark, there are no contractual provisions to mimic competition and stimulate the MSP contractors to export. Finally, one must recall that the MSP premium to the DND originates from three sources: the imposition of domestic production that translates into an obligation to pay at least part of the contractor overhead costs, including the facilities of course; the imposition of CAF priority in case of peak munitions demand invoking the necessity of excess capacity in off-peak times, leading to a peak-load charge similar to that of an insurance premium; and the fact that production is compartmentalized, with each compartment being a franchise monopoly entitling contractors to an economic profit.

A new munitions procurement mechanism must specify its inherent policies and their objectives by classifying them into short and long-term options as well as combinations. For instance, long-term policies may include auctioning of franchises rather than allocating them by negotiation, narrowing down the contractor's mandate over the range of products produced, with the possibility of procurement from international suppliers as NATO stan-

dardization encourages. Short-term policies could introduce some competition to promote exports in order to exploit scale economies by inducing partial yardstick competition for contiguous products.

The first policy suggestion is an easy-to-implement, short-term measure with deep long-term consequences. It involves injecting competition into the market for CAF munitions items by auctioning off a given product that is currently bundled and that can be produced by another contractor. This change doesn't require any modification to the current SSAs because such a measure is not forbidden under the current agreements. According to articles 7.3 and 7.4 in the GD-OTS SSA, products can be added to or subtracted from the bundle of products of a contractor. Although mutual agreement is specified as a precondition, the worst case scenario would be to wait for the next round of SSAs.

Another way of implementing the same policy would be by dual-sourcing the same product and hence implementing yardstick competition. Evidently, the former modification introduces competition *for the market* whereas the latter introduces competition *in the market*. Dual-sourcing must be complemented by a mechanism to reward cost savings by reallocating purchase quantities towards the more efficient contractor over time. Moreover, just to distinguish the two forms of competition further, the product-auctioning approach would inflict auctioning costs whereas dual-sourcing could raise production costs simply because the competing contractors' production runs would be shortened. This policy may, at least in the short run, induce lower prices and, by introducing competition in some form, have desirable long-term consequences of enhancing efficiency and, as a consequence, boost exports and undo the scale problem felt especially in the dual-sourcing form of competition. This policy change can also prove experimental and may easily be reversed in case of disappointing

outcomes and, alternatively, gradually expanded in case of better outcomes.

We have to note two complementary changes required to implement this policy. The policy would imply either a return to individual-product SSCs or the preservation of bundles without the competed product plus a separate SSC for the competed product. Alternatively, the implementation would require an enlargement of a contractor's bundle in order to induce overlaps, multiple sourcing and hence competition.

The second policy suggestion would be a further step towards competition by endogenizing the bundles assigned to contractors. The current bundle structures are determined historically and thus inflexible as they are non-competitively awarded. Since contractors are producing bullets, propellants and explosives, the bundles can be endogenized without new entry. Any one of the three known mechanisms for awarding monopoly franchises, namely auctioning them off, through negotiations, or through "beauty contests" (negotiation by predetermined rules), can be used to redraw the bundle boundaries with cost minimization and export capabilities as the prime objectives.

The third policy suggestion requires revisiting a strategic aspect of the current MSP, namely its definition of "surge" and the related excess capacity requirement. Since munitions demand for training and exercises is fairly stable and thus predictable, the surge capacity can be replaced with a combination of somewhat larger stocks and strict contractual obligations rather than incurring the cost of maintaining an unused domestic surge capacity.

Of course, this policy suggestion could be moot if the domestic excess capacity can be maintained due to export revenues while surge supplies would be contractually guaranteed by contingent export contracts. Excess capacity as basis for exports may, at a surge, allow lower price and higher quantity flexibility than the above combination policy. Yet, contractors do

not face high-powered incentives to export in the current contractual environment.

The fourth policy suggestion may hinge on Canada's free trade agreement with the EU. Recently, various European defence procurement initiatives, combined with NATO's standardization initiative, have generated progress towards a more competitive European armaments market. If Canadian contractors gain access to European markets and are also exposed to European competition in the domestic market, the CAF's demand for munitions can be met at lower program cost. Large European suppliers like BAE Systems, Rheinmetall and Nammo, some of whom already supply the CAF with other equipment, may compete for individual munitions or whole bundles or simply bid for franchises.

The fifth policy suggestion is based on the observation that SSCs may, by expropriating the profits based on the contractor's cost-reduction effort, be undermining incentives for cost reduction and hence efficiency improvements conducive to comparative advantage and access to global supply chains. A few options exist: fixed-price contracts may be indexed to exogenously-given input prices and comparable world product prices (which would require unbundling); the resulting profits can be shared through an incentive contract or the regulatory lag can be increased upward from one year. Contractors would thus be rewarded for cost reductions and could gain access to global markets.

7 References

Aghion, P., M. Dewatripont, L. Du, A. Harrison, and P. Legros (2012). Industrial Policy and Competition. *NBER Working Paper* (18048).

Arena, M. V. and J. Birkler (2009). Determining When Competition Is a Reasonable Strategy for the Production Phase of Defense Acquisition. *RAND - National Defence Research Institute*.

Australian National Audit Office (2010). Procurement of Explosive Ordnance for the Australian Defence Force. *Department of Defence* (Audit Report No. 24), 1–200.

BBC News (2012). BAE Systems plans to cut 105 jobs at Glascoed, Monmouthshire. http://www.bbc.co.uk, *BBC News, South East Wales*. Accessed 2/01/2014.

Bergmann, K. (2012). Munitions Production - An Expensive Business. http://www.asiapacificdefencereporter.com, *Asia Pacific Defence Reporter, Melbourne and Canberra*. Accessed 1/20/2014.

Borrmann, J. (2008). Awarding Monopoly Franchises Repeatedly: Are Second-Best Block-Rate Tariffs Attainable Without Regulation? *Applied Economics 40*(12), 1519–1528.

Brickley, J. A., S. Misra, and R. L. van Horn (2006). Contract Duration: Evidence from Franchising. *Journal of Law and Economics 49*, 173–196.

Brownrigg, S. (2013). Presentation on Munitions Management at the Royal Military College of Canada. October 2013.

Cameron, R. J. (1985). Year Book, Australia, 1985 (No. 69). *Australian Bureau of Statistics*, 39–57.

Chief of Review Services (2007). Evaluation of the Munitions Supply Program (MSP). *Department of National Defence* (1258-101-4 (CRS)), 1–28.

Chuter, A. (2012). BAE to Expand Exports, Products - Wants To Use U.K. Ammunition Agreement as Template. http://www.defensenews.com, *Defense News*. Accessed 2/01/2014.

Colt Canada (2013). Official Website. http://www.coltcanada.com, *Colt Canada*. Accessed 11/14/2013.

Commission, F. T. (2006). FTC Challenges General Dynamics Purchase of SNC Technologies: General Dynamics Required to Sell its Interest in American Ordnance to Restore Competition in the Production and Assembly of Ammunition for Mortars and Artillery. http://www.ftc.gov/, *FTC*. Accessed 5/10/2014.

Cotterill, D. (2008). ADI, past, present and future. http://www.australiandefence.com.au, *Australian Defence Magazine*. Accessed 1/20/2014.

Deagel (2008). UK MoD and BAE Systems Sign Ammunition Supply Contract for the Next 15 Years. http://www.deagel.com, *Deagel*. Accessed 2/01/2014.

Defence Industry Daily (2008). MASS for Effect: The UK's Long-Term Ammo Contract. http://www.defenseindustrydaily.com, *Defence Industry Daily*. Accessed 2/01/2014.

Defence Materiel Organisation (2013a). Domestic Munitions Manufacturing Arrangements (DMMA) Project. http://www.defence.gov.au, *Department of Defence*. Accessed 1/20/2014.

Defence Materiel Organisation (2013b). Domestic Munitions Manufacturing Arrangements (DMMA) Project – Background. http://www.defence.gov.au, *Department of Defence*. Accessed 1/20/2014.

Defence Materiel Organisation (2014). DMO Groups and Divisions. http://www.defence.gov.au, *Department of Defence*. Accessed 1/20/2014.

General Dynamics Ordnance and Tactical Systems Canada (2013). Official Website. http://www.gd-otscanada.com, *General Dynamics*. Accessed 11/14/2013.

Grevatt, J. (2013). Australia Shortlists Three Consortia for Ammunition Supply. *IHS Jane's Defence Industry, July 28, 2013*.

H. Demsetz (1968). Why Regulate Utilities? *Journal of Law and Economics 11*, 55–65.

Harrison, A. and A. Rodriguez-Claire (2009). Trade, Foreign Investment, and Industrial Policy for Developing Countries. *NBER Working Paper* (15261).

Hix, W. M., B. Held, and E. M. Pint (2004). *Lessons from the North - Canada's Privatization of Military Ammunition Production*. RAND - National Defense Research Institute. ISBN 0-8330-3634-3.

IMT Corporation (2013). Official Website. http://imtcorporation.com/home, *IMT*. Accessed 11/14/2013.

Industry Canada (2013a). Company Profile - Colt Canada. http://www.ic.gc.ca, *Government of Canada*. Accessed 11/14/2013.

Industry Canada (2013b). Company Profile - General Dynamics Ordnance and Tactical Systems-Canada. http://www.ic.gc.ca, *Government of Canada*. Accessed 11/14/2013.

Industry Canada (2013c). Company Profile - IMT Corporation. http://www.ic.gc.ca, *Government of Canada*. Accessed 11/14/2013.

Industry Canada (2013d). Company Profile - Magellan Aerospace. http://www.ic.gc.ca, *Government of Canada*. Accessed 11/14/2013.

J. Church and Ware, R. (2000). Industrial Organization: A Strategic Approach. *Irwin McGraw-Hill*.

King, B., P. Gobinet, G. P. Paoli, and M. Pyadushkin (2010). Surveying Europe's Production and Procurement of Small Arms and Light Weapons Ammunition - The Cases of Italy, France, and the Russian Federation. *Small Arms Survey - Working Paper*.

KPMG (2012a). Economic Impact of the Defence and Security Industry in Canada. *KPMG Advisory Services*, 1–46.

KPMG (2012b). Regional Economic Impact and Assessment: Economic Evaluation Report. *Department of Defence* (AN08), 1–80.

Magellan Aerospace (2013). Official Website. http://www.magellan.aero, *Magellan Aerospace*. Accessed 11/14/2013.

MFRTech (2011). Colt Defense LLC to Host Investor Conference Call on 2010 Year End Financial Results. http://www.mfrtech.com, *MFR Tech*. Accessed 11/14/2013.

National Audit Office (2010). Delivering Multi-Role Tanker Aircraft Capability. *U.K. National Audit Office HC 433*.

Office of the Auditor General of Canada (1988). 1988 Report of the Auditor General of Canada. http://www.oag-bvg.gc.ca, Accessed 11/14/2013.

Pugliese, D. (2011). Browning and Sig Sauer Handguns. *Defence Watch, September 9, 2011*.

Release, G. D. P. (2006). General Dynamics Completes Acquisition of SNC Technologies Inc. http://www.generaldynamics.com/, *General Dynamics*. Accessed 5/10/2014.

Release, N. P. (2011). Increased Margin, Despite a Lower Top Line. http://www.nammo.com/, *NAMMO*. Accessed 5/10/2014.

Riordan, M. H. and D. Sappington (1987). Awarding Monopoly Franchises. *American Economic Review 77*(3), 375–387.

Rogerson, W. P. (1994). Economic Incentives and the Defense Procurement Process. *Journal of Economic Perspectives 8*(4), 65–90.

Sloan, E. (2012). Canada and NATO: A Military Assessment. *Canadian International Council and Canadian Defence and Foreign Affairs Institute, Strategic Studies Working Group Paper, May 2012*.

Solomon, B. (1999). Canada's Defence Industrial Base. *The Department of National Defence*.

Tadelis, S. and O. Williamson (2012). Transaction Cost Economics. Working Paper, Available at SSRN: http://ssrn.com/abstract=2020176.

U.K. White Paper (2005). Defence Industrial Strategy: Defence White Paper. *U.K. Government*.

Vickrey, W. (1961). Counterspeculation, Auctions, and Competitive Sealed Tenders. *Journal ofFinance 16*, 8–37.

Williamson, O. E. (1976). Franchise Bidding for Natural Monopolies - in General and with Respect to CATV. *Bell Journal of Economics 7*, 73–104.